2

INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

243rd Engineering Installation Squadron
and
265th Combat Communications Squadron

South Portland Air National Guard Station
Maine Air National Guard
South Portland, Maine

February 1991

AIR NATIONAL GUARD

HAZWRAP SUPPORT CONTRACTOR OFFICE
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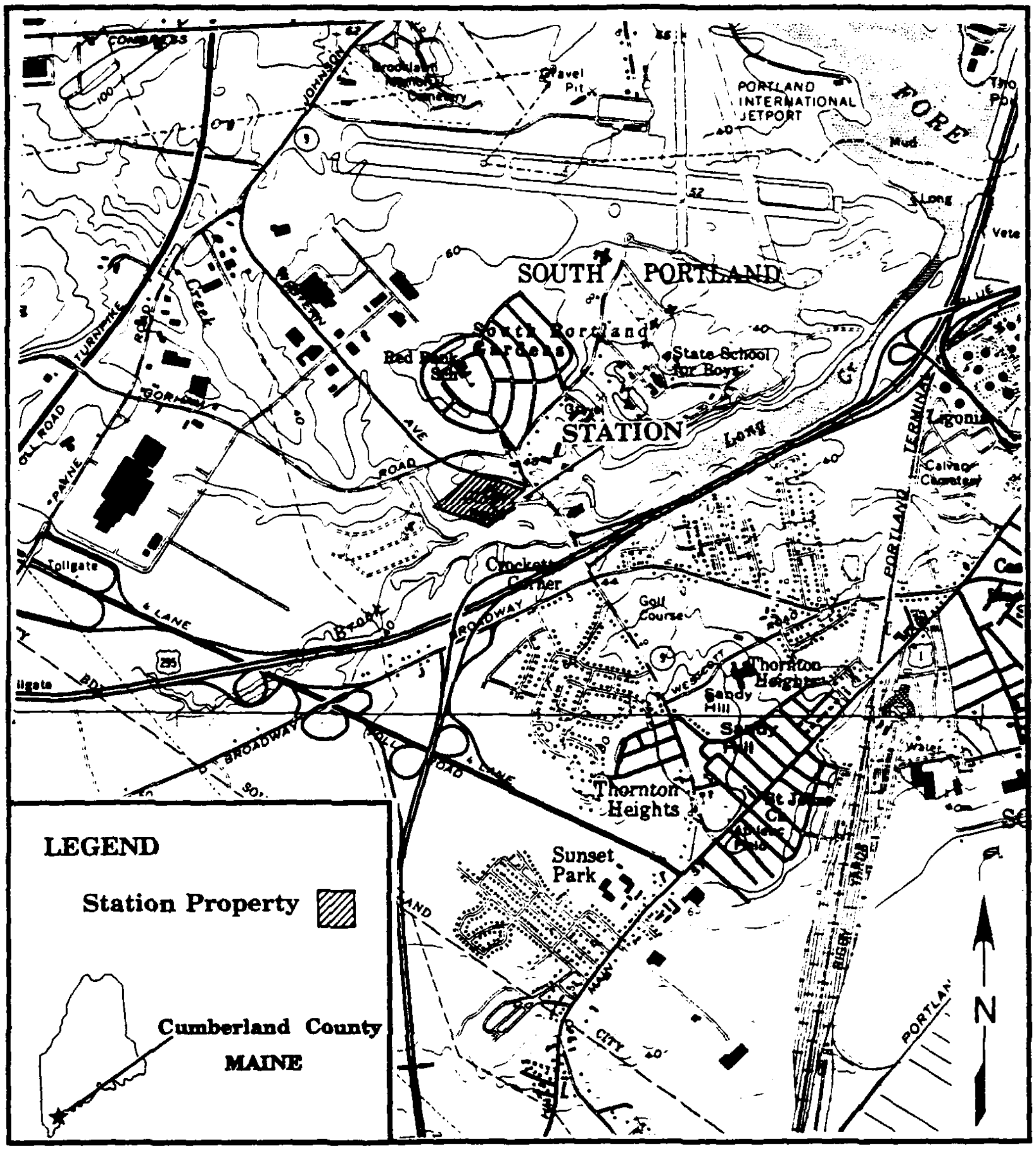

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*

2. REPORT DATE
February 1991

3. REPORT TYPE AND DATES COVERED
Preliminary Assessment

4. TITLE AND SUBTITLE
Preliminary Assessment
243rd Engineering Installation Squadron
265th Combat Communications Squadron
South Portland Maine Air National Guard Station

5. FUNDING NUMBERS

6. AUTHOR(S)
N/A

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Science and Technology, Inc.
704 South Illinois Ave.
Oakridge, TN 37830

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Hazardous Waste Remedial Actions Program
Oakridge, TN

Air National Guard Bureau
Andrews AFB, Maryland 20331

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*
Preliminary environmental assessment for the South Portland Air National Guard Station, as part of the Installation Restoration Program. The report reflects data gathered from records review, interviews, and a site visit. No sites were identified as potentially contaminated and the base will be recommended for no further action.

14. SUBJECT TERMS Maine Air National Guard; South Portland Air National Guard Station; Preliminary Assessment; Installation Restoration Program;

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT
Unclassified

18. SECURITY CLASSIFICATION OF THIS PAGE

19. SECURITY CLASSIFICATION OF ABSTRACT

20. LIMITATION OF ABSTRACT

INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT

243rd ENGINEERING INSTALLATION SQUADRON
AND
265th COMBAT COMMUNICATIONS SQUADRON
SOUTH PORTLAND AIR NATIONAL GUARD STATION
MAINE AIR NATIONAL GUARD
SOUTH PORTLAND, MAINE

Prepared for

National Guard Bureau
Andrews Air Force Base, Maryland 20331-6008

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Contract No. DE-AC05-87OR21704

A-1

Submitted to

HAZWRAP Support Contractor Office
Oak Ridge, Tennessee
Operated by Martin Marietta Energy Systems, Inc.
for the Department of Energy,
Under Contract DE-AC05-84OR21400

February 1991

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

ACRONYM LIST

AGE	Aerospace Ground Equipment
AMSL	Above Mean Sea Level
ANG	Air National Guard
CCG	Combat Communications Group
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CES	Civil Engineering Squadron
CFR	Code of Federal Regulations
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EIS	Engineering Installation Squadron
EO	Executive Order
EPA	Environmental Protection Agency
FR	Federal Register
FS	Feasibility Study
HAS	Hazard Assessment Score
HAZWRAP	Hazardous Waste Remedial Actions Program
IRP	Installation Restoration Program
MOGAS	Automotive Gasoline
NGB	National Guard Bureau
OSHA	Occupational Safety and Health Administration
OWS	Oil/Water Separator
PA	Preliminary Assessment
PCB	Polychlorinated Biphenyls
PL	Public Law
POL	Petroleum, Oil, and Lubricant
RCRA	Resource Conservation and Recovery Act of 1976
R&D	Research and Development
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act of 1986
SciTek	Science & Technology, Inc.
SI	Site Investigation
USAF	United States Air Force
USC	United States Code
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UST	Underground Storage Tank

EXECUTIVE SUMMARY

A. INTRODUCTION

Science & Technology, Inc. (SciTek) was retained to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) of the 243rd Engineering Installation Squadron (EIS) and the 265th Combat Communications Squadron (CCS), South Portland Air National Guard (ANG) Station [hereinafter referred to as the Station], Maine Air National Guard, located in the city of South Portland, Maine. For the purpose of this document, the Station shall include the area leased through the Air Force for use by the ANG.

The PA included the following activities:

- o an on-site visit, including interviews with a total of seven persons familiar with Station operations, and field surveys by SciTek representatives during the week of July 23-25, 1990;
- o acquisition and analysis of information on past hazardous materials use, waste generation, and waste disposal at the Station;
- o acquisition and analysis of available geological, hydrological, meteorological, and environmental data from federal, state, and local agencies; and
- o the identification and assessment of sites on the Station that may have been contaminated with hazardous wastes.

B. MAJOR FINDINGS

The 243rd EIS and the 265th CCS have used hazardous materials and generated small amounts of wastes in mission-oriented operations and maintenance at the Station since 1964.

Operations that have involved the use of hazardous materials and the disposal of hazardous wastes include vehicle maintenance and aerospace ground equipment (AGE) maintenance. The hazardous wastes disposed of through these operations include varying quantities of petroleum-oil-lubricant (POL) products, acids, paints, thinners, strippers, and solvents.

The field surveys and interviews resulted in no sites being identified that exhibit the potential for contaminant presence and migration.

C. CONCLUSIONS

It has been concluded there are no sites where a potential for contaminant presence exists.

D. RECOMMENDATIONS

No further work under the IRP is recommended.

I. INTRODUCTION

A. Background

The 243rd Engineering Installation Squadron (EIS) and the 265th Combat Communications Squadron (CCS), South Portland Air National Guard (ANG) Station [hereinafter referred to as the Station] is located in South Portland, Maine. Both units have been active at the Station since 1964. Both the past and current operations have involved the use of potentially hazardous materials and the disposal of wastes. Because of the use of these materials and the disposal of resultant wastes, the National Guard Bureau (NGB) has implemented the Installation Restoration Program (IRP).

The IRP is a comprehensive program designed to:

- o Identify and fully evaluate suspected problems associated with past hazardous waste disposal and/or spill sites on Department of Defense (DoD) installations and

- o Control hazards to human health, welfare, and the environment that may have resulted from these past practices.

During June 1980, DoD issued a Defense Environmental Quality Program Policy Memorandum (DEQPPM 80-6) requiring identification of past hazardous waste disposal sites on DoD installations. The policy was issued in response to the Resource Conservation and Recovery Act of 1976 (RCRA) and in anticipation of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, Public Law (PL) 96-510), commonly known as "Superfund." In August 1981, the President delegated certain authority specified under CERCLA to the Secretary of Defense via an Executive Order (EO 12316). As a result of EO 12316, DoD revised the IRP by issuing DEQPPM 81-5 (December 11, 1981), which reissued and amplified all previous directives and memoranda.

Although the DoD IRP and the Environmental Protection Agency (EPA) Superfund programs were essentially the same, differences in the definition of program activities and lines of authority resulted in some confusion between DoD and state/federal regulatory agencies. These difficulties were rectified via passage of the Superfund Amendments and Reauthorization Act (SARA, PL-99-499) of 1986. On January 23, 1987, Presidential Executive Order EO 12580 was issued. EO 12580 effectively revoked EO 12316 and implemented the changes promulgated by SARA.

The most important changes effected by SARA included the following:

- o Section 120 of SARA provides that federal facilities, including those in DoD, are subject to all provisions of CERCLA/SARA concerning site assessment, evaluation under the National Contingency Plan [40CFR300], listing on the National Priorities List, and removal/remedial actions. DoD must therefore comply with all the procedural and substantive requirements (guidelines, rules, regulations, and criteria) promulgated by the EPA under Superfund authority.

- o Section 211 of SARA also provides continuing statutory authority for DoD to conduct its IRP as part of the Defense Environmental Restoration Program (DERP). This was accomplished by adding Chapter 160, Sections 2701-2707 to Title 10 United States Code (10 USC 160).

- o SARA also stipulated that terminology used to describe or otherwise identify actions carried out under the IRP shall be substantially the same as the terminology of the regulations and guidelines issued by the EPA under their Superfund authority.

As a result of SARA, the operational activities of the IRP are currently defined and described as follows:

- o **Preliminary Assessment**

  The Preliminary Assessment (PA) process consists of personnel interviews and a records search designed to identify and evaluate past disposal and/or spill sites that might pose a potential and/or actual hazard to public health, public welfare, or the environment. Previously undocumented information is obtained through the interviews. The records search focuses on obtaining useful information from aerial photographs; Station plans; facility inventory documents; lists of hazardous materials used at the Station; Station subcontractor reports; Station correspondence; Material Safety Data Sheets; federal/state agency scientific reports and statistics; federal administrative documents; federal/state records on endangered species, threatened species, and critical habitats; documents from local government offices; and numerous standard reference sources.

- **Site Inspection/Remedial Investigation/Feasibility Study**

The Site Inspection consists of field activities designed to confirm the presence or absence of contamination at the potential sites identified in the PA. An expanded Site Inspection has been designed by the Air National Guard as a Site Investigation. The Site Investigation (SI) will include additional field tests and the installation of monitoring wells to provide data from which site-specific decisions regarding remediation actions can be made. The activities undertaken during the SI fall into three distinct categories: screening activities, confirmation and delineation activities, and optional activities. Screening activities are conducted to gather preliminary data on each site. Confirmation and delineation activities include specific media sampling and laboratory analysis to confirm either the presence or the absence of contamination, levels of contamination, and the potential for contaminant migration. Optional activities will be used if additional data is needed to reach a decision point for a site. The general approach for the design of the SI activities is to sequence the field activities so that data are acquired and used as the field investigation progresses. This is done in order to determine the absence or presence of contamination in a relatively short period of time, optimize data collection and data quality, and to keep costs to a minimum.

The Remedial Investigation (RI) consists of field activities designed to quantify and identify the potential contaminant, the extent of the contaminant plume, and the pathways of contaminant migration.

If applicable, a public health evaluation is performed to analyze the collected data. Field tests, which may necessitate the installation of monitoring wells or the collection and analysis of water, soil, and/or sediment samples, are required. Careful documentation and quality control procedures in accordance with CERCLA/SARA guidelines ensure the validity of data. Hydrogeologic studies are conducted to determine the underlying strata, groundwater flow rates, and direction of contaminant migration. The findings from these studies result in the selection of one or more of the following options:

1. **No Further Action** - Investigations do not indicate harmful levels of contamination that pose a significant threat to human health or the environment. The site does not warrant further IRP action, and a Decision Document will be prepared to close out the site.

2. **Long-Term Monitoring** - Evaluations do not detect sufficient contamination to justify costly remedial actions. Long-term monitoring may be recommended to detect the possibility of future problems.

3. **Feasibility Study** - Investigation confirms the presence of contamination that may pose a threat to human health and/or the environment, and some sort of remedial action is indicated. The Feasibility Study (FS) is therefore designed and developed to identify and select the most appropriate remedial action. The FS may include individual sites, groups of sites, or all sites on an installation. Remedial alternatives are chosen according to engineering and cost feasibility, state/federal regulatory requirements, public health effects, and environmental impacts. The end result of the FS is the selection of the most appropriate remedial action with concurrence by state and/or federal regulatory agencies.

- **Remedial Design/Remedial Action**

  The Remedial Design involves formulation and approval of the engineering designs required to implement the selected remedial action. The Remedial Action is the actual implementation of the remedial alternative. It refers to the accomplishment of measures to eliminate the hazard or, at a minimum, reduce it to an acceptable limit. Covering a landfill with an impermeable cap, pumping and treating contaminated groundwater, installing a new water distribution system, and in situ biodegradation of contaminated soils are examples of remedial measures that might be selected. In some cases, after the remedial actions have been completed, a long-term monitoring system may be installed as a precautionary measure to detect any contaminant migration or to document the efficiency of remediation.

- **Research and Development**

  Research and Development (R&D) activities are not always applicable for an IRP site but may be necessary if there is a requirement for additional research and development of control measures. R&D tasks may be initiated for sites that cannot be characterized or controlled through the application of currently available, proven technology. It can also, in some instances, be used for sites deemed suitable for evaluating new technologies.

- **Immediate Action Alternatives**

  At any point, it may be determined that a former waste disposal site poses an immediate threat to public health or the environment, thus necessitating prompt removal of the contaminant. Immediate action, such as limiting access to the site, capping or removing contaminated soils, and/or providing an alternate water supply may suffice as effective

control measures. Sites requiring immediate removal action maintain IRP status in order to determine the need for additional remedial planning or long-term monitoring. Removal measures or other appropriate remedial actions may be implemented during any phase of an IRP project.

B. Purpose

The purpose of this IRP PA is to identify and evaluate suspected problems associated with past waste handling procedures, disposal sites, and spill sites associated with Station activities.

The potential for migration of hazardous contaminants was evaluated by visiting the Station, reviewing existing environmental data, analyzing Station records concerning the use of hazardous materials and the generation of hazardous wastes, and conducting interviews with current Station personnel who had knowledge of past waste disposal techniques and handling methods. Pertinent information collected and analyzed as part of the PA included a records search of the history of the Station; the local geological, hydrological, and meteorological conditions that might influence migration of contaminants; and ecological settings that indicate environmentally sensitive conditions.

C. Scope

The scope was limited to the identification of sites at or under primary control of the Station and evaluation of potential receptors. The PA included:

- an on-site visit during the week of July 23-25, 1990;
- acquisition of records and information on hazardous materials use and waste handling practices;
- acquisition of available geological, hydrological, meteorological, land use and zoning, critical habitat, and related data from federal and state agencies;
- a review and analysis of all information obtained; and
- preparation of a summary report to include recommendations for further action.

The subcontractor effort was conducted by the following Science & Technology, Inc. (SciTek) personnel: Mr. Tracy C. Brown, Environmental Analyst; Mr. Charles T. Goodroe, Environmental Protection Specialist; and Mr. Stephen

B. Selecman, Geologist/Hydrogeologist. Mr. Michael Minior of the NGB is Project Officer for this Station and participated in the overall assessment during the week of the station visit. Mr. Steve Fleming of the Hazardous Waste Remedial Actions Program (HAZWRAP) also participated in the station visit.

The point of contact (POC) at the Station was Master Sergeant Donald Day. Major Scott A. Young (101st Civil Engineering Squadron) was the representative from their civil engineering support facility.

D. Methodology

The PA began with a visit to the Station to identify all operations that may have used hazardous materials or may have generated hazardous wastes. Figure I.1 is a flow chart of the PA methodology.

Seven past and present Station employees familiar with the various operating procedures were interviewed. These interviews were conducted to determine those areas where waste materials (hazardous or nonhazardous) were used, spilled, stored, disposed of, or released into the environment. The interviewees' knowledge and experience with Station operations averaged 17 years and ranged from 1 to 26 years.

Records contained in the Station files were collected and reviewed to supplement the information obtained from the interviews.

Detailed geological, hydrological, meteorological, and environmental data for the area were obtained from the appropriate federal, state, and local agencies. A listing of agency contacts is included as Appendix A.

After a detailed analysis of all the information obtained, it was concluded that no sites were identified to be potentially contaminated with hazardous wastes. Under the IRP program, when sufficient information is available, sites are numerically scored and assigned a Hazard Assessment Score (HAS) using a hazard assessment rating methodology. However, the absence of a HAS does not necessarily negate a recommendation for further IRP investigation, but rather, may indicate a lack of data.

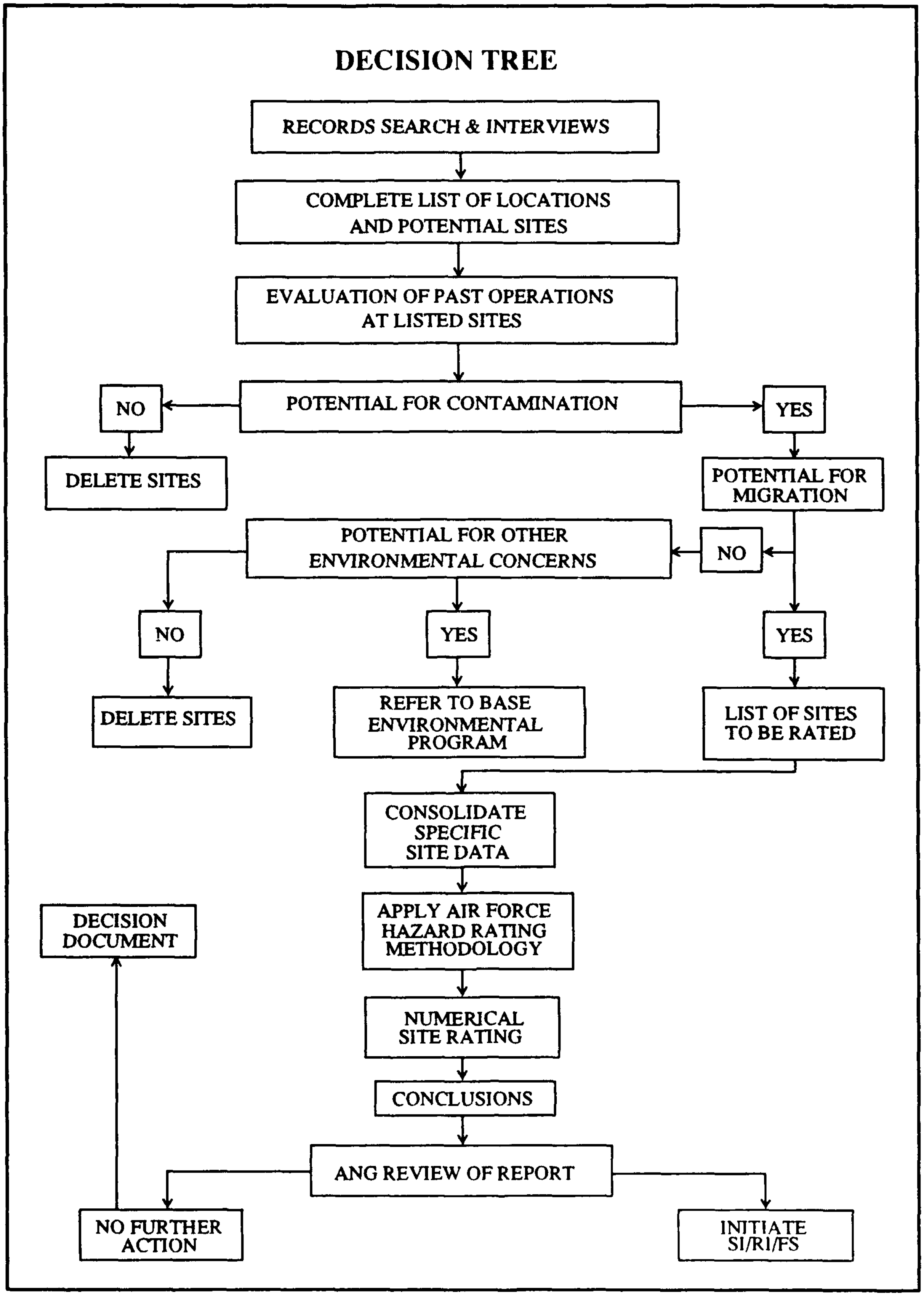


Figure I.1

Preliminary Assessment Methodology Flow Chart

II. INSTALLATION DESCRIPTION

A. Location

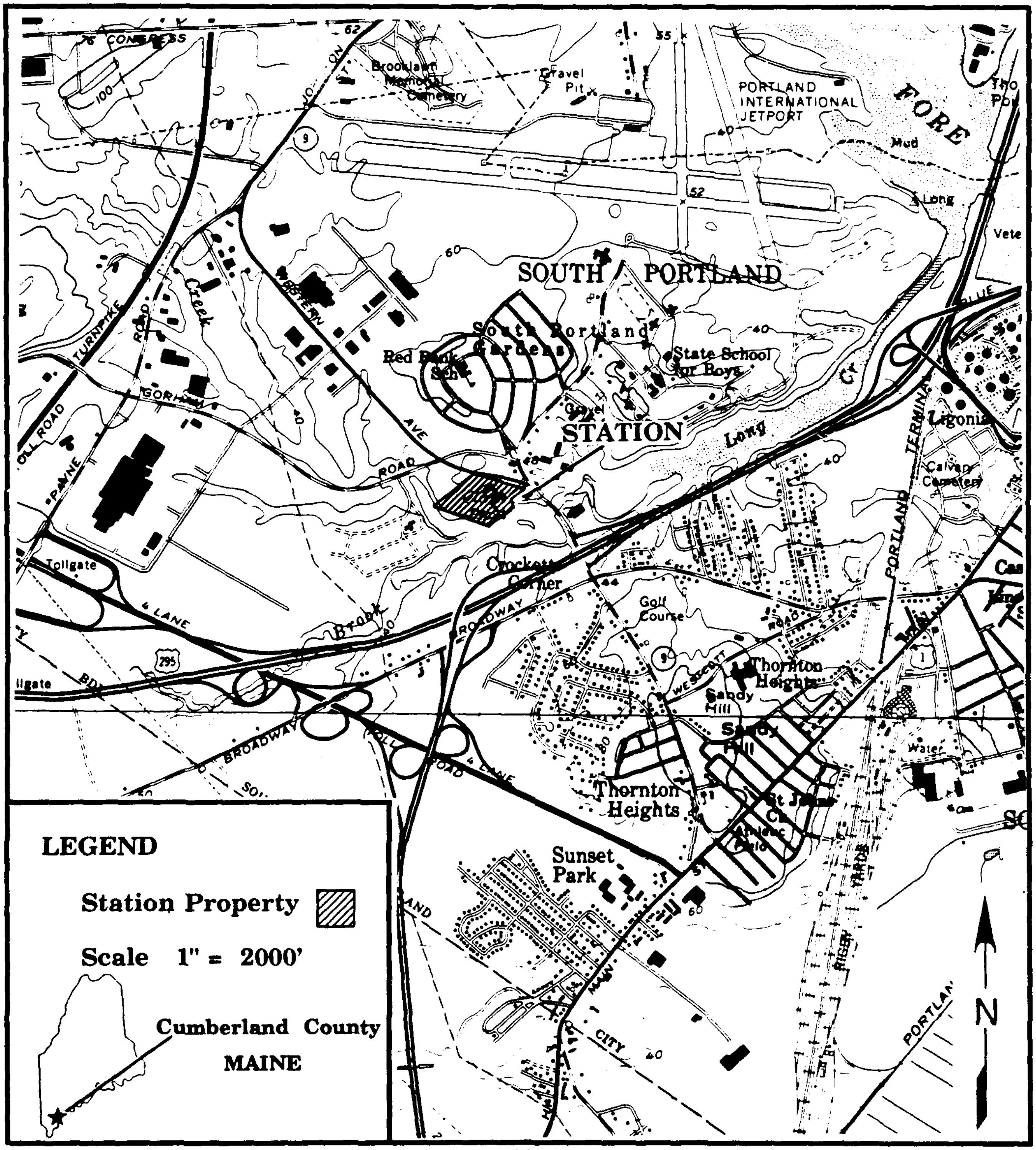
The Station is located at 50 Western Avenue within the city of South Portland and the county of Cumberland, Maine. It is located on a relatively flat parcel of property with the southwest portion sloping to Long Creek. Elevation of the Station is 66 feet above mean sea level (AMSL). Figure II.1 illustrates the location and boundaries of the Station.

The property is owned by the state of Maine and is leased through the Air Force for use by the ANG. The Station occupies a total of 12 acres and is completely fenced. Eight permanent (brick) or prefabricated (metal) structures which support both the 243rd EIS and the 265th CCS in their respective operations are located on the property . The population of the Station during the week numbers 31 members. Unit Training Assembly (UTA) occurs one weekend per month. The Station population during this weekend is 150 members for the 265th CCS and 202 members for the 243rd EIS. However, the Station cannot support the UTAs of both units at the same time.

B. Organization and History

Two organizations occupy the Station. The 243rd EIS is the host organization, and the 265th CCS is the tenant organization. When the main building was completed in June 1964, both units moved onto the property now known as the South Portland ANG Station. In 1979, the south wing of the building was added to provide a dedicated area for both units to perform vehicle maintenance. This allowed the AGE maintenance shop of the 265th CCS to move from Building #2 to the old vehicle maintenance shop, which was in the main building. The latest addition to the Station is the communications building that was completed in 1990. This building is used exclusively by the 265th CCS. The remaining buildings on the property provide storage areas for mission equipment, expendable supplies, and hazardous materials. One structure is dedicated for the temporary storage of hazardous wastes prior to their disposition. Prior to the construction of the Station, the property was unimproved and is believed to have been farmland.

The 265th CCS is the primary generator of waste materials, whereas the 243rd EIS produces waste materials to a much lesser degree. Both units moved from Fort Williams, Cape Elizabeth, Maine at the same time (June 1964). The 265th CCS was originally organized as the 104th Aircraft Control and Warning Squadron on October 31, 1950. On July 1, 1953, it was redesignated as the 265th Communications Squadron. Over the years, the unit has experienced several name changes but always retained its numerical designator. The



SOURCE: USGS, Portland West and Prouts Neck Quadrangles, 7.5 Minute Series Topographic, 1978.

Figure II.1

Location Map of
the South Portland Air National Guard Station

mission of the 265th CCS is to organize, equip, and train to provide a flexible response to tactical communications requirements in support of tactical Air Force flying operations at deployment locations. The scope of their mission has not changed significantly over the years. Mission improvements have been made through advancements in technology. The 265th CCS has a vehicle maintenance shop and an AGE shop.

The 243rd EIS was organized on October 1, 1956. The unit has been redesignated several times over the years; however, like the 265th CCS, it has retained its numerical designator. The mission of the 243rd EIS is to accomplish the engineering, installation, removal, and relocation of communications-computer facilities, and to perform serviceability certifications, emergency and/or programmed on-site repairs and modifications of equipment. Their mission has not changed significantly except for equipment improvements. In addition, the 243rd EIS has a vehicle maintenance shop.

The repair and servicing of motor vehicles and AGE items have taken place on the property since the ANG took possession. Currently, four underground storage tanks (USTs) for #2 fuel oil, diesel oil, and MOGAS are located on the property. Two above ground tanks for #2 fuel oil are located in Building #5. One oil/water separator (OWS) prevents waste products from entering the sewer system. Throughout the years, two USTs and one above ground tank have been removed from the property with no evidence of environmental or property degradation.

Materials recognized as hazardous have been generated on this property since the establishment of the Station. With the awareness of hazardous materials and the recognition of their impact on the environment, acceptable disposable practices and procedures have evolved. The majority of hazardous wastes are now collected and disposed of through contractors and the Defense Reutilization and Marketing Office (DRMO).

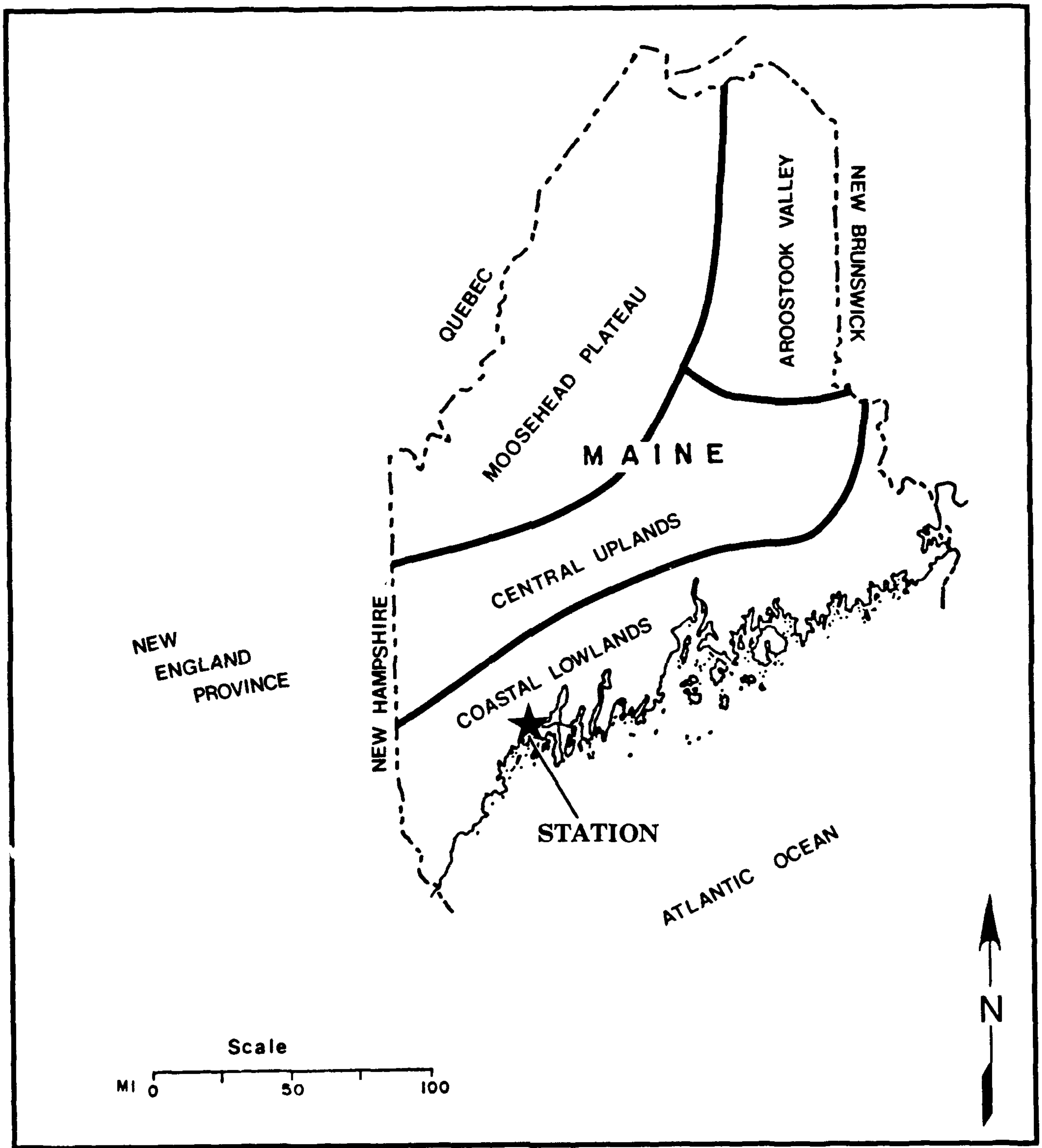
III. ENVIRONMENTAL SETTING

A. Meteorology

The following climatological data are largely derived from the Climatic Atlas of the United States (United States Department of Commerce, National Climatic Center, Asheville, N.C., 1979), the Weather of U.S. Cities (Gale Research Company, 1985), and the Soil Survey of Cumberland County, Maine (United States Department of Agriculture (USDA): Soil Conservation Service, 1974). Cumberland County is predominantly characterized by a continental climate with maritime influences affecting the coastal regions. Summers are cool to moderately warm, and winters are severe with effects extending well into spring. The total average annual precipitation, based on records from Portland (1871-1983), is 42.5 inches, and it is fairly evenly distributed throughout the year. Precipitation ranges from an average monthly high of 4.02 inches in November to an average monthly low of 3.01 inches in August. By calculating net precipitation according to the method outlined in the Federal Regulations CERCLA Pollution Contingency Plan (United States Environmental Protection Agency, 55 FR 8813 Subpart K, March 8, 1990), a net precipitation value of 19.5 inches is obtained. The one-year, 24-hour rainfall event for the county is approximately 2.5 inches. Along the coastal areas, thunderstorms can occur on an average of 15 to 20 days each year, usually in the summer months. An average of 72.5 inches of snow accumulates annually at Portland, and a continuous snow cover of one inch or more can be expected along the coast for approximately 60 days each winter. The average annual temperature is 45.5°F (1874-1983), and it ranges from an average monthly high of 68.3°F in July to an average monthly low of 22.2°F in January. The prevailing wind direction is from the south in the late spring and summer and from the north and west the remainder of the year. The average annual wind speed is 8.7 mph and is fairly consistent throughout the year.

B. Geology

Maine is located in the New England physiographic province of the Appalachian Highlands region. The state is further subdivided into four physiographic sections, and the Station is located in the eastern most of these sections known as the Coastal Lowlands (Figure III.1). The Coastal Lowlands section is bounded to the east by the Atlantic Ocean and to the west by the Central Uplands section. A gentle topographic slope, located approximately 38 miles northwest from the Station and oriented in a northeasterly direction, marks the boundary between the Central Uplands and Coastal Lowlands sections. Flat to gently rolling topography is characteristic of the Coastal Lowlands; however, low level mountains do exist. The topography slopes gently toward the ocean, and the average elevation of the region is approximately 100



SOURCE: Schafer, J. P. and J. H. Hartshorn, 1965; Prescott, G. C., Jr., 1963.

Figure III.1

Physiographic Map of Maine

feet AMSL. The Station is located very near the coastline along the upper reaches of Portland Harbor where topography is nearly flat and low-lying (Prescott, 1963). The surface elevation on the Station property ranges from 74 feet to 20 feet AMSL.

The geology of Maine is complex and is a composite of sedimentary deposition, tectonic deformation, volcanism, erosion, and glaciation. The stratigraphic sequence consists of Precambrian to Mississippian age bedrock formations and unconsolidated Pleistocene to Recent surficial deposits. Bedrock is composed primarily of marine sedimentary deposits that have been metamorphosed to varying degrees and have been significantly deformed structurally in response to tectonic events. In addition, intrusive and extrusive igneous rocks do exist but to a lesser degree. Following the deposition and deformation of the bedrock formations, the bedrock surface was modified by fluvial erosion from Mississippian time to the beginning of the Pleistocene epoch and by subsequent glacial erosion during the Pleistocene epoch (Prescott, 1963).

At least two major phases of glaciation in Maine contributed to the erosion of the bedrock surface and the ensuing deposition of unconsolidated glacial material which currently blankets the bedrock surface. The glacial deposits in Maine are predominantly associated with the last major phase of glaciation that occurred in late-Wisconsinan time. A continental ice sheet advanced southward across the region completely covering the state of Maine and extending past its coastline onto the continental shelf (Maine Geological Survey, 1983). In the wake of the advance and retreat of the ice sheet, glacial material was deposited on top of bedrock in the form of nonstratified and stratified glacial drift. Furthermore, the earth's crust subsided under the weight of the ice sheet and resulted in the coastal regions of Maine being inundated by the Atlantic Ocean. The submergence of the coastline resulted in the deposition of glacial material along with marine sediments in this area (Maine Geological Survey, 1983, and Prescott, 1963).

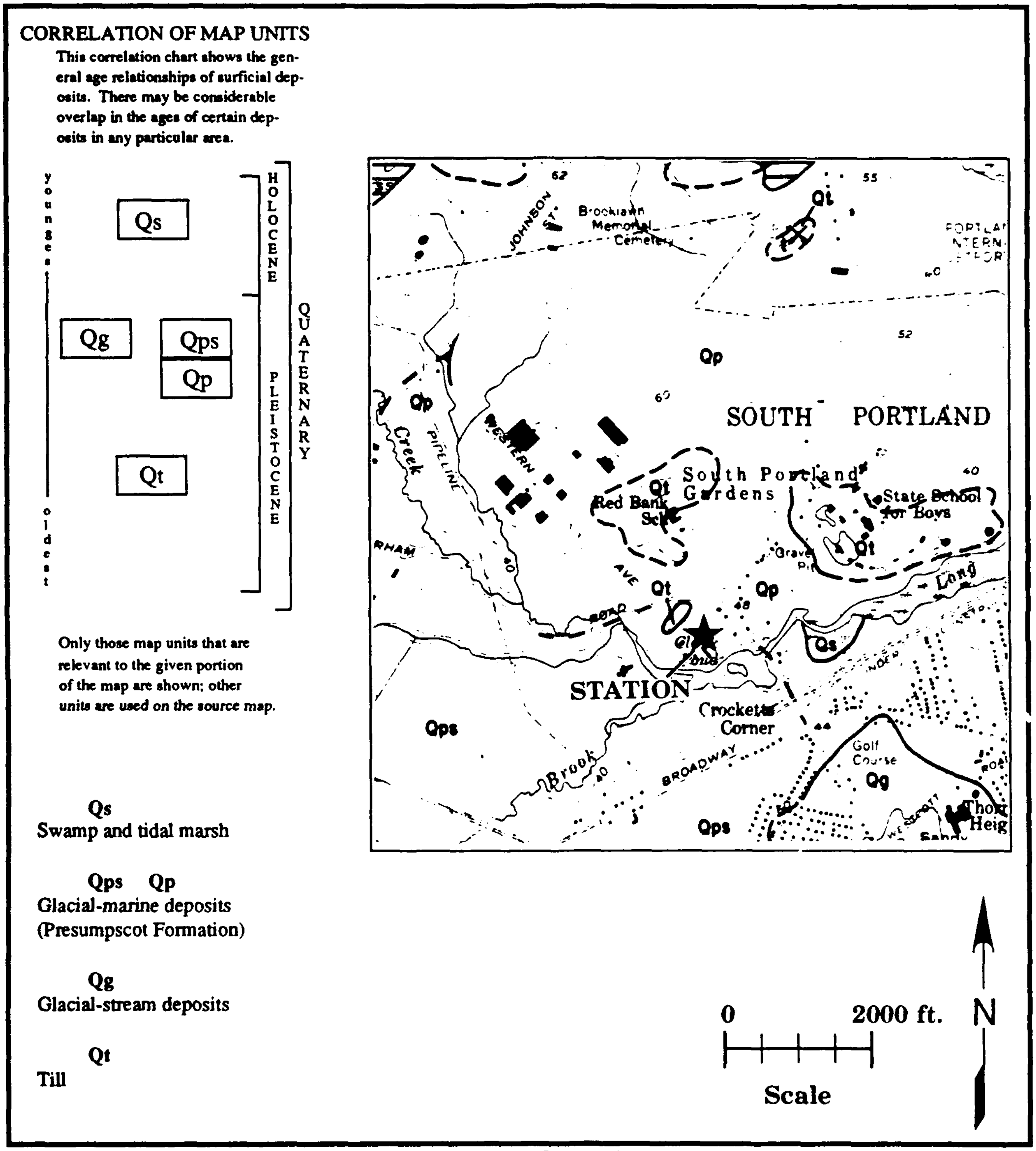
The most widespread glacial deposits occur as nonstratified glacial till that was deposited directly from the ice sheet. Glacial till is composed of an unsorted and nonstratified mixture of clay, silt, sand, gravel, cobbles, and boulders. As a result of the unsorted and nonstratified nature of the till, it characteristically has low permeability (Thompson, 1976). Till occurs as an almost continuous thin veneer of varying thickness covering the bedrock surface in upland areas; therefore, exposures of till at the ground surface are generally limited to upland areas. However, till can exist in the lowlands, but it is most likely concealed by younger deposits (Prescott, 1976). Glacial till also exists locally in the form of end-moraines and drumlins that may form some of the existing topographic hills and ridges (Thompson, 1976). The thickness of the glacial till in the Portland area ranges from 0 to 110 feet (Prescott, 1976).

Unlike glacial till, stratified glacial drift was deposited by meltwater that was primarily derived from deglaciation during the retreat of the ice sheet. The meltwater transported and reworked glacial material thereby depositing it in stratified and sorted layers of permeable sand and gravel. Stratified drift has been categorized by its depositional occurrence as ice-contact drift and outwash plain drift (Prescott, 1976). Ice-contact drift is deposited within the ice sheet or in areas of direct contact with the ice sheet. These deposits can be well-sorted to poorly sorted and are generally composed of sand, gravel, and cobbles, with some silt and boulders. Ice-contact deposits are not widespread in the Portland area (Prescott, 1976). Outwash deposits include all stratified glacial material deposited by meltwater flowing from the ice front. The outwash deposits generally consist of well-sorted sand and gravel and originate from stream and deltaic sedimentation. As a result of the association of stratified drift with meltwater, the deposits are generally limited in occurrence and areal extent to valleys and topographic lowlands. The thickness of the stratified drift deposits in the Portland area ranges from 0 to 100 feet (Prescott, 1963 and 1976).

In the coastal area where marine invasion occurred as a result of glacial subsidence, a combination of glacial and marine deposits are widespread. The glacial marine deposits consist of sediments that washed out of the ice sheet and accumulated on the ocean floor in conjunction with marine sediments. Glacial marine deposits are composed primarily of silt, clay, and sand; however, layers of sand and gravel do occur. The permeability is generally poor, but in areas where sand deposits exist, the permeability can be moderate to high (Thompson, 1976). The glacial marine deposits underlie most outwash deposits and overlie stratified drift, till, and bedrock in the coastal area. Glacial marine deposits form a large part of the Presumpscot formation in the coastal region (Prescott, 1976).

The Presumpscot formation is the surficial material immediately underlying the Station property (Figure III.2). Commonly, the Presumpscot is composed of silt, clay, and fine sand. At the Station location, the Presumpscot consists primarily of impermeable silt and clay (Thompson, 1976) and is likely underlain by glacial till. The existence of till at a shallow depth is evidenced in soil boring records that were taken during the construction of the communications building (Appendix B). In addition, a small area of till crops out along the northern boundary of the Station thereby further substantiating its occurrence in the subsurface. The overall thickness of the surficial material at the Station location is projected at approximately 50 to 75 feet (Caswell and Lanctot, 1976).

The bedrock in the vicinity of the Station is composed of members of the Casco Bay Group which is believed to be of Ordovician, Silurian, and Devonian age (Figure III.3). The Casco Bay Group generally consists of a combination of pelites, subpelites, volcanic rocks, and immaturely reworked volcanics. Sedimentary rocks of the Casco Bay Group have been significantly metamor-



SOURCE: Thompson, W. B., Reconnaissance Surficial Geology of the Portland West Quadrangle, Maine, 1976.

Figure III.2

Surficial Geologic Map of the Area

System	Group	Geologic Unit	Characteristics
Ordovician	Casco Bay Group	Jewell Formation	Sulfidic and nonsulfidic muscovite-biotite-garnet-quartz schist with minor micaceous quartzite interbeds.
or		Spurwink Limestone	Thinly interbedded gray limestone and biotite phyllite.
Silurian or		Scarboro Formation	Sulfidic and nonsulfidic muscovite-biotite-garnet quartz schist with minor micaceous quartzite interbeds along with greenish gray quartz-plagioclase-chlorite-biotite-garnet schist.
Devonian		Diamond Island Formation	Sooty black, rusty-weathering quartz-graphite-muscovite phyllite.
		Spring Point Formation	Greenish gray plagioclase-quartz-chlorite-biotite-garnet schist, plagioclase-quartz-chlorite actinolite schist and quartz-plagioclase-biotite gneiss.
		Cape Elizabeth Formation	Quartz-plagioclase-muscovite phyllite or schist with chlorite biotite, garnet or staurolite depending on grade of metamorphism. Carbonate locally common in biotite and chlorite zones, along with thin-bedded to laminated quartz-plagioclase-biotite schist and quartzite with minor carbonate or calc silicate beds.
		Cushing Formation	Plagioclase-quartz-biotite gneiss with minor amphibolite, along with very sulfidic, rusty weathering garnet-biotite-amphibole gneiss.

SOURCE: **Hussey, A. M.**, Geologic Map of the Portland Quadrangle, Maine. Maine Geological Survey, 1971.

Figure III.3

Generalized Stratigraphic Column of the Area

phosed to varying degrees. Specifically, the Station is underlain by the Spring Point and Cape Elizabeth formations. The Spring Point formation is mapped as occurring under the northwest one-half of the property while the Cape Elizabeth formation exists under the southeast one-half. The contact between the Spring Point and Cape Elizabeth formations is conformable and is inferred as traversing through the center of the Station property in a northeast-southwest direction. Both the Spring Point and Cape Elizabeth formations are basically quartz-plagioclase schist (Figure III.3) and occur within the biotite metamorphic facies at this location (Hussey, 1971). As a result of the degree of metamorphism, both rock units contain little or no primary porosity and permeability.

The rock units of the Casco Bay Group, at this location, occur on the southwest end of the Casco Bay synclinorium which has a general northeast to southwest orientation and an overall plunge to the northeast. The synclinorium is characterized by an abundance of folding and, to a lesser degree, faulting. The major anticlines and synclines in the area are relatively open features and are often slightly overturned to the southeast. The folds occur in an alternating sequence with the orientation of the rock formations generally sloping toward the axes of the synclines and away from the axes of the anticlines. In addition, evidence indicates the extensive occurrence of smaller, more tightly closed parasitic folds along the limbs of the larger folds. The parasitic folds, where they occur, produce local variations in the attitude of the rock units. Specifically, the Station is located on the northwest limb of the Saco syncline near its northeastern nose (Hussey, 1971). At this location, the rock cleavage dips approximately 55° to the southeast toward the axis of the syncline (Hussey, 1971).

Several major normal faults are mapped in the southwestern part of the Casco Bay synclinorium. Most faults are believed to be steeply dipping normal faults; however, evidence indicates some strike-slip and thrust faults do exist. No major faults are mapped as occurring in the immediate vicinity of the Station. The nearest faults with regards to the Station are the Nunsuch River and South Portland faults that exist 1.75 miles northwest and 3.1 miles southeast, respectively (Hussey, 1971).

The soils underlying the Station property are composed of the Crogham, Swanton, Colton, and Buxton series. These soil classifications are generally deep (0 to 60 inches), nearly level to moderately sloping, somewhat poorly drained to excessively drained, medium- to coarse-textured soils. The majority of the Station is underlain by the Crogham loamy sand (DeB). Specifically, the southern three fourths of the property is occupied predominantly by the DeB soil unit, with a small areal occurrence of the Buxton silt loam (BuC_2) along the southern boundary. Typically, the DeB occurs in association with coastal terraces and consists of a loamy sand surface layer (0 to 15 inches) and a sand

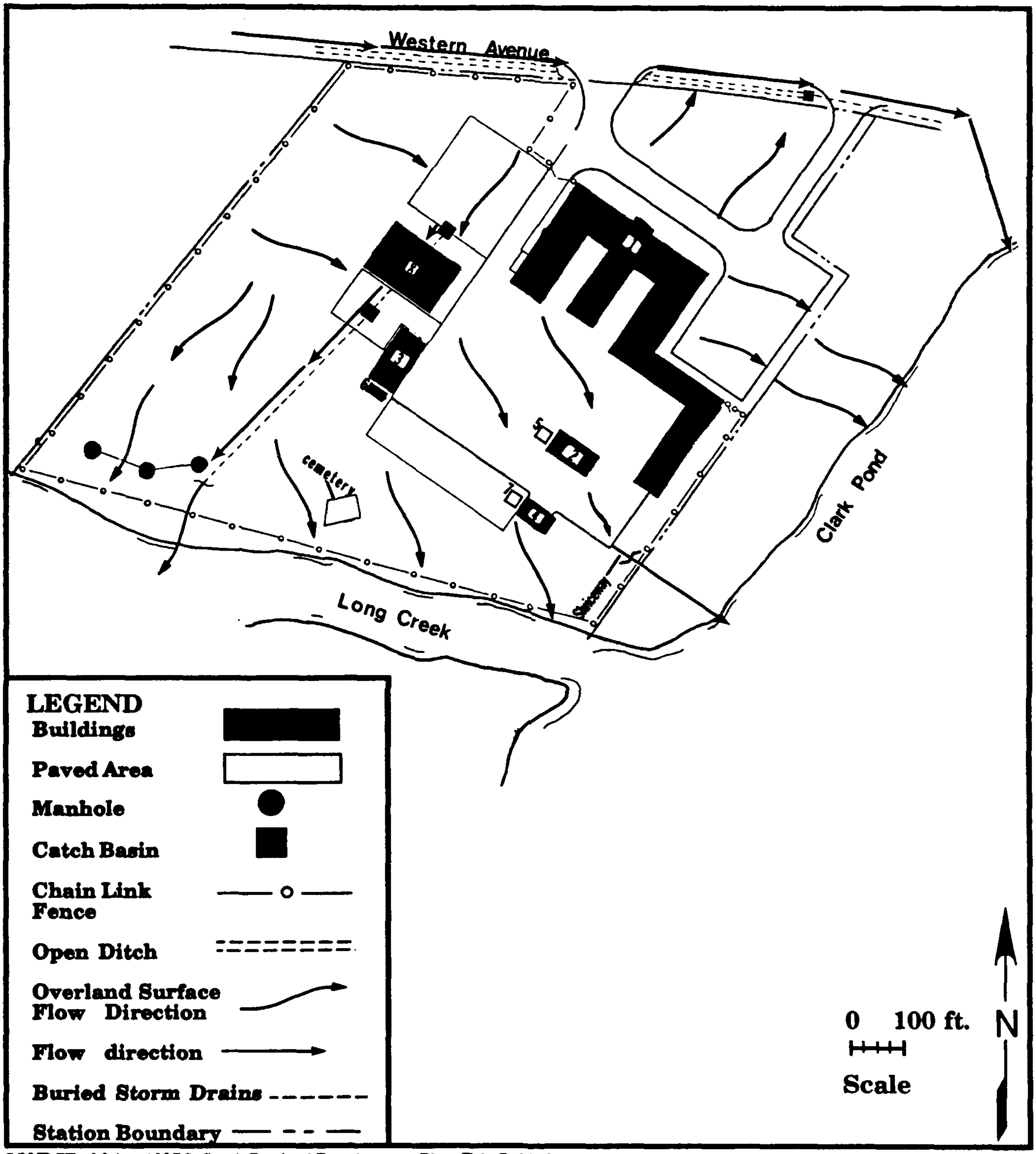
subsoil (15 to 60 inches). The surface layer permeability is classified as moderately slow (0.20 to 0.63 inches per hour or 1.41 x 10^{-4} to 4.45 x 10^{-4} cm/sec), and the subsoil permeability is considered to have rapid or greater permeability (> 6.0 inches per hour or > 4.24 x 10^{-3} cm/sec). The BuC_2 soil exists in association with fluvial features such as Long Creek which exists along the southern boundary of the Station. The BuC_2 surface layer is a silt loam (0 to 12 inches) with moderately slow to moderate permeability (0.20 to 2.00 inches per hour or 1.41 x 10^{-4} to 1.41 x 10^{-3} cm/sec), and the subsoil is a silty clay (12 to 60 inches) with slow to moderately slow permeability (0.06 to 0.63 inches per hour or 4.24 x 10^{-5} to 4.45 x 10^{-4} cm/sec).

The northern one fourth of the Station property is occupied by the Swanton fine sandy loam (Sz) and the Colton-Buxton complex (HnB). The Sz soils form in association with depressional features and characteristically have a fine sandy loam surface layer (0 to 32 inches) with moderate permeability (0.63 to 2.00 inches per hour or 4.45 x 10^{-4} to 1.41 x 10^{-3} cm/sec). The subsoil (32 to 60 inches) consists of a silty clay with less than moderately slow permeability (< 0.20 inches per hour or < 1.41 x 10^{-4} cm/sec). HnB soils form in association with glacial outwash deposits on terraces. This soil unit typically has a gravelly sandy loam surface layer (0 to 10 inches), a gravelly loamy sand subsoil (10 to 19 inches), and a very gravelly sand substratum (19 to 60 inches). Each layer of the HnB soil is classified as having greater than rapid permeability (> 6.0 inches per hour or > 4.24 x 10^{-3} cm/sec). The information pertaining to soils contained in this text was compiled from the Soil Survey of Cumberland County, Maine (USDA: Soil Conservation Service, 1974).

C. Hydrology

1. Surface Water

The Station is located along the banks of Long Creek and Clark Pond at their confluence (Figure III.4). Surface water is primarily drained from the Station by means of overland flow. However, one buried storm drainage system exists that is designed to collect overland flow from the northern part of the property. Two catch basins are located east and west from Building #8 and are used to collect surface water and transport it west to an outflow point located inside the Station fence. From the outflow point, surface water flows via natural drainage to the west and outfalls the Station property immediately into Long Creek (Figure III.4). In addition, the western part of the Station property, which is undeveloped, drains surface water directly into Long Creek by means of overland flow. Surface water from the western area of the Station flows via natural drainageways to the southwest and south to outfall the Station along the southwest boundary. In the southwest part of the building complex, surface water flow occurs overland in a southerly direction and is collected in the south corner of the complex. Surface water is then transported through



SOURCE: Maine ANGS, South Portland Development Plan, Tab C, 1968.

Figure III.4

Drainage Map of
the South Portland Air National Guard Station

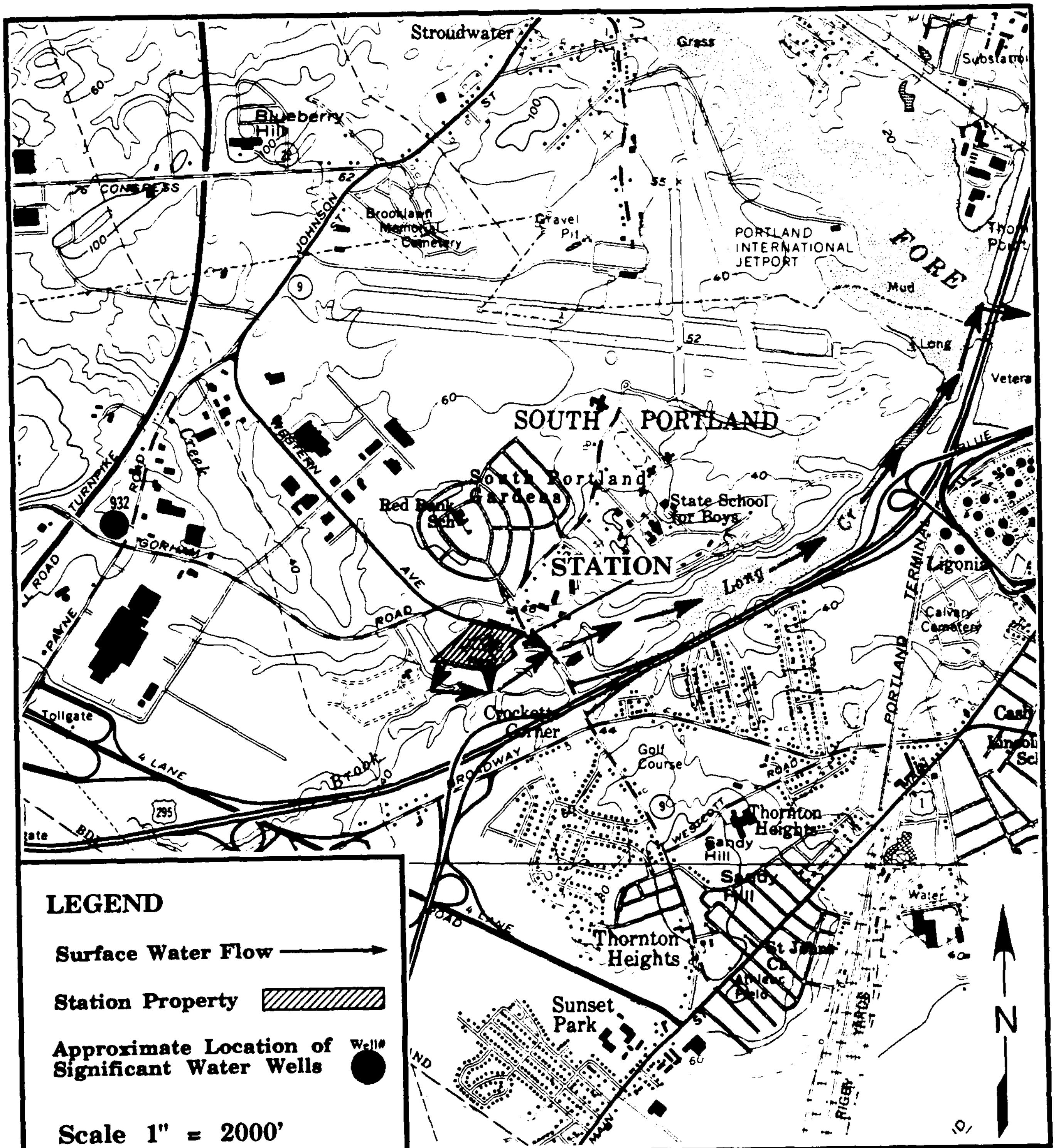
a sluiceway and empties onto the ground just inside the Station boundary. From this point, flow continues south and outfalls the Station property into a small marsh-like area before entering Clark Pond. The eastern part of the building complex is drained overland in two directions (Figure III.4). The parking area located southeast of Building #1 drains surface water south-southeast where it outfalls the Station along the south boundary en route to Clark Pond. In addition, surface water east of Building #1 is collected in an open ditch where flow is to the southeast to Clark Pond.

All surface water from the Station ultimately empties into Clark Pond which is formed by the confluence of Long Creek and Red Brook (Figure III.5) Water exiting Clark Pond flows northeast in Long Creek approximately 1.5 miles where it adjoins the Fore River at the upper reaches of Portland Harbor. The northeast bank of Long Creek marks the southwest boundary of the Station property, and a small area located outside the southwest perimeter fence along Long Creek is considered to be within the 100-year flood plain. The remainder of the Station property is situated outside the limits of the 100-year flood plain (Federal Emergency Management Agency, 1981).

2. Groundwater

Groundwater in Maine primarily occurs in the unconsolidated deposits of glacial origin and in the underlying consolidated bedrock formations. The stratified glacial sand and gravel deposits of fluvial origin are the principal aquifers in Maine with respect to water yield capabilities; however, they are limited in their depositional occurrence. Nonstratified glacial deposits are areally extensive but are poor aquifers because of their characteristic low permeability. The occurrence and movement of groundwater in the bedrock formations is a function of secondary porosity and permeability. The bedrock aquifers generally have a lower water yield capacity with respect to the stratified glacial aquifers, but they are significant as a result of their extensive areal occurrence. Secondary porosity and permeability produced by fracturing is widespread in the region; therefore, the bedrock can function as an aquifer at almost any location. Consequently, the stratified glacial aquifers are an important source of public and domestic water supplies locally, and the bedrock aquifers provide a generally reliable widespread source of domestic water. In terms of the Station location, the available geological data indicate the stratified glacial aquifers are absent, and the occurrence of groundwater is limited to the non-stratified glacial deposits and the underlying bedrock formations.

The unconsolidated glacial material consists primarily of nonstratified till, stratified outwash, stratified ice-contact, and glacial marine deposits. The ability of the glacial deposits to transmit and store groundwater is a function of their porosity and permeability which is determined by the degree of particle sorting, stratification, and texture of the material. In general, the porosity and



SOURCE: USGS, Portland West and Prouts Neck Quadrangles, 7.5 Minute Series Topographic, 1978.

Figure III.5

Surface Water Flow Route Map

permeability of the unconsolidated deposits is increased proportionately along with the particle size and the degree of particle sorting. Nonstratified till is a poor aquifer because of the lack of permeability that is attributable to the high concentration of fine material resulting from poor sorting. In addition, glacial marine deposits are generally poor aquifers because they commonly have low porosity and permeability as a result of their dominant clay and silt lithology. Glacial marine and nonstratified deposits are generally saturated; however, they transmit groundwater very slowly because of their low permeability. Although these deposits are commonly nonpermeable, they can contain interbedded layers of permeable sand and gravel on a localized basis (Prescott, 1963). Stratified glacial deposits generally contain the highest porosity and permeability and are unparalleled in their ability to store and transmit groundwater. The permeability associated with the stratified deposits is a result of fluvial meltwater processes that are responsible for sorting and depositing larger textured materials. The coarse-grained sand and gravel deposits are the best unconsolidated aquifers (Prescott, 1963). Aquifer yield is dependent on saturated thickness, extent, and grain size of the stratified deposits (Prescott, 1976). The largest reported yield from the stratified glacial aquifer in the Portland area is 100 GPM (gallons per minute).

The bedrock formations in the Portland area consist primarily of metamorphic and igneous rocks that are basically dense and impermeable. The occurrence and movement of groundwater in the bedrock formations is a function of secondary porosity and permeability. Secondary openings are primarily associated with fracturing of the bedrock that was produced by the structural deformation characteristic of the region. As a result of the regional deformation, the existence of fracturing in the bedrock is widespread, and groundwater can be found to occur at most locations. Although fracturing is extensive, it is not uniform in size and frequency. Consequently, the ability of the bedrock to transmit and store groundwater varies greatly from one location to another. It is impossible to predict the depth and extent of water bearing fractures. However, fracturing of the bedrock occurs with a greater frequency in association with geologic features such as faults and folds (Prescott, 1963 and 1976). In addition, the size and frequency of fractures is believed to decrease generally with increased depth (Clapp, 1909). The majority of domestic wells encounter sufficient fracturing at an average depth of 177 feet below the land surface. Water yields from bedrock wells range from 0 to 150 GPM, and the average yield is 11 GPM (Prescott, 1976).

Groundwater in the bedrock generally exists under confined or artesian conditions except in recharge areas where the water table is at a shallow depth. In contrast, groundwater in the shallow unconsolidated deposits commonly occurs in an unconfined or water table state. Artesian conditions can be found locally in the unconsolidated deposits where impermeable marine clay overlies permeable sand or gravel deposits.

Groundwater recharge generally occurs locally and is derived from precipitation and surface water runoff. The underlying bedrock is recharged by percolating groundwater where fractures are exposed to the overlying surficial deposits. In areas where the surficial material is permeable, the recharge of the bedrock and unconsolidated aquifers is enhanced. This is especially true in areas where permeable surface deposits exist in close proximity to a surface body of water. In these areas, the aquifer can be recharged by induced infiltration from the surface water body. Conversely, groundwater recharge is much slower in areas where the unconsolidated deposits are nonpermeable (Prescott, 1963).

Groundwater movement generally occurs from recharge areas to discharge points along stream valleys. Recharge and discharge points represent high areas and low areas, respectively, in the potentiometric surface. Groundwater always moves down gradient from high to low points which often correspond to similar surface topography. The down gradient direction is generally interpreted as being perpendicular to topographic surface elevation contours and toward stream valleys.

The unconsolidated surficial deposits underlying the Station are historically very poor aquifers. The near surface occurrence of the glacial marine Presumpscot formation likely restricts the downward movement of surface water to the underlying nonstratified glacial till. Although the nonstratified till is generally a poor aquifer, it is saturated and predominantly exists below the water table at the Station location. The water table at the Station ranges from approximately 5 to 10 feet below the land surface. Shallow groundwater movement in the nonstratified till likely occurs in a southerly direction toward Long Creek and Clark Pond. The ability of the bedrock to store and transmit groundwater at the Station location cannot be determined because of the relationship of groundwater to random fracturing. It is probable that groundwater occurs and is transmitted through the bedrock at the Station location because of the extensive occurrence of fracturing in the area. Groundwater movement in the bedrock at the Station is interpreted from a potentiometric surface map as being south-southeasterly. The regional groundwater flow direction is to the southeast. The potentiometric surface of the bedrock aquifer is inferred as existing at approximately 30 feet AMSL or 20 feet below the land surface at the Station (Caswell and Lanctot, 1976). The nearest water well with respect to the Station is located approximately 1 mile to the west (Figure III.5). Water well #932 is screened in the bedrock aquifer at a total depth of 160 feet, and it had a total water yield of 20 GPM in 1970.

The susceptibility of the groundwater to contamination should a potentially hazardous release occur at the Station is considered to be a moderate to moderately high risk. This conclusion stems from the low permeability of the surficial deposits present and their inability to function as an aquifer. Although the surficial deposits transmit groundwater very slowly, the water table exists at a very high level which increases the exposure to surface

contaminants. In addition, contaminants released into the groundwater system on the Station property would have to migrate only a short distance before being discharged into Clark Pond. It is believed that the greatest risk from a contaminant release would be to the surface water in Clark Pond. This is attributed to the nonpermeable glacial marine surficial deposits that likely promote surface water runoff and to the direct discharge of surface water drainage into Clark Pond.

D. Critical Habitats/Endangered or Threatened Species

According to the state of Maine, Department of Inland Fisheries and Wildlife, no endangered or threatened species of flora or fauna have been identified within a 1-mile radius of the Station. There are no officially designated critical habitats within this area.

Marine habitats that are of national or statewide significance for coastal wildlife occur within a 1-mile radius of the Station. Such areas support "... an exceptionally high abundance and diversity of wildlife." Such areas occur along Long Creek approximately 1000 feet northeast of the Station and extend to its confluence with the Fore River. Development and use of such areas is either prohibited or restricted (Jones et al, 1988). Surface water runoff from the Station flows into this portion of Long Creek indirectly via Clark Pond.

Numerous wetland areas are located within a 1-mile radius of the Station. The closest of these are adjacent to Station property along Clark Pond and Long Creek [United States Fish and Wildlife Service, National Wetlands Inventory Map (Portland West, ME. Quadrangle), 1982].

IV. SITE EVALUATION

A. Activity Review

A review of Station records and interviews with personnel were used to identify specific operations in which the majority of hazardous materials and/or hazardous wastes are used, stored, processed, and disposed of. Table IV.1 provides a history of waste generation and disposal for operations conducted by shops at the Station. If an item is not listed on the table on a best-estimated basis, that activity or operation produces negligible (less than 1 gallon/year) waste requiring disposal.

The potable water supply for the Station is provided by the Portland Water District. This water comes from Sebago Lake, which is located 11.5 miles northwest of the Station. Sanitary sewer service is provided by the city of South Portland.

B. Disposal/Spill Site Information, Evaluation, and Hazard Assessment

Seven persons were interviewed to identify and locate potential sites that may have been contaminated by hazardous wastes as a result of past Station operations. No potentially contaminated sites were identified.

C. Other Pertinent Facts

- Trash and nonhazardous solid wastes from the Station are collected and disposed of by Blanchard Disposal Service.
- Before the Air National Guard began activities at the Station in 1964, the lease area was farmland.
- No abandoned USTs were identified at the Station.
- In 1964, a 2000 gallon UST was installed at a point now located under the northeast corner of the Vehicle Maintenance Shop. From 1964 until 1970, this tank was used to store MOGAS. From 1970 until 1978, it was used for liquid waste storage by the Vehicle Maintenance and AGE Shops. In 1978, immediately prior to construction of the current Vehicle Maintenance Shop, the tank was removed.

Table IV.1 Hazardous Materials/Hazardous Wastes Disposal Summary: South Portland Air National Guard Station, South Portland, Maine.

Shop Name and Location	Possible Hazardous Wastes	Estimated Quantities (Gallons/Year)	Method of Disposal 1964 — 1970 — 1980 — 1990
Vehicle Maintenance (Building 001)	Engine Oil	150	CONTR
	Battery Acid	10	NEUT/SAN | CONTR
	Ethylene Glycol	50	SAN | CONTR
	Gear Oil	25	CONTR
	Hydraulic Oil	50	NIU | CONTR
	Transmission Fluid	10	CONTR
	Paint Thinner	25	CONTR
	Brake Fluid	5	CONTR
	Diesel Fuel	150	CONTR
	MOGAS (Leaded)	25	CONTR | NLU
	MOGAS (Unleaded)	25	NIU | CONTR
	Bearing Grease	25 Lbs	CONTR
	Parts Cleaner	300	CONTR
	Paint	5	TRASH | CONTR

KEY:

CONTR - *Disposed of through a contractor.*
NEUT - Material neutralized with a chemical agent.
NIU - Material was not in use at this time.
NLU - Material no longer used.
OWS - Disposed of through a sanitary sewer line connected to an oil/water separator.
SAN - Disposed of through the sanitary sewer.
TRASH - Disposed of in trash that goes to city landfill.
UNK - Disposal method is unknown.
* This quantity disposed of every other year.

Note: Beginning in 1990, the Station is sending waste engine oil to the 101st Air Refueling Wing in Bangor, Maine for use as furnace fuel.

Table IV.1 Hazardous Materials/Hazardous Wastes Disposal Summary: South Portland Air National Guard Station, South Portland, Maine (continued).

Shop Name and Location	Possible Hazardous Wastes	Estimated Quantities (Gallons/Year)	Method of Disposal (1964 – 1970 – 1980 – 1990)
Vehicle Maintenance (Building 001) (continued)	Gunk	5	SAN | NLU
	Safety Kleen	300	NIU | CONTR
Aerospace Ground Equipment (AGE) Maintenance (Building 001)	Engine Oil	140	CONTR
	JP-4	1	NIU | CONTR
	PD-680	10	NIU | SAN/OWS | NLU
	Parts Cleaner	300	NIU | CONTR
	MOGAS (Leaded)	1	CONTR | NLU
	Battery Acid	5	NEUT/SAN | CONTR
	7808 Oil	8	NIU | CONTR | NLU
	Diesel Oil	7	NIU | CONTR
	Ethylene Glycol	4*	NIU | UNK
	Paint Containers	12	TRASH
	Safety Kleen	300	NIU | CONTR

KEY:

CONTR - Disposed of through a contractor.
NEUT - Material neutralized with a chemical agent.
NIU - Material was not in use at this time.
NLU - Material no longer used.
OWS - Disposed of through a sanitary sewer line connected to an oil/water separator.
SAN - Disposed of through the sanitary sewer.
TRASH - Disposed of in trash that goes to city landfill.
UNK - Disposal method is unknown.
* This quantity disposed of every other year.

Note: Beginning in 1990, the Station is sending waste engine oil to the 101st Air Refueling Wing in Bangor, Maine for use as furnace fuel.

- A 500 gallon underground storage tank was used for liquid waste storage by the Vehicle Maintenance and AGE Shops from 1964 to 1987. This tank, which was removed in 1987, was located just outside of the southeast wall of the old Vehicle Maintenance wing (1964-1979) of Building #1. The access pipe to this tank was inside the Vehicle Maintenance Shop.

- A leach pit, referred to as a leach field on the engineering drawings for the Station, is located just outside of the southeast wall of the old Vehicle Maintenance wing of Building #1. According to Station personnel, the water table elevation is often higher than the bottom of the lift pit, and seeping water collects in it. Use of the lift pit requires periodic flushing of this water. The leach pit was installed exclusively to receive the water flushed from the lift pit.

  The lift pit and the leach pit have not been focuses of hazardous waste disposal. Small, inadvertent oil spills in the lift pit have been rare, and it was clean during the Station visit. When a UST was removed in 1987, excavations accidentally broke into the subsurface leach pit structure. With the exception of a slight oil sheen, the interior of the structure was observed to be clean.

- An OWS is located in the paint booth portion of the current Vehicle Maintenance Shop. This OWS is connected to the sanitary sewer system. The oil holding tank is checked every six to eight months and is cleaned as necessary.

- A National Pollutant Discharge Elimination System Permit is not required of the Station.

- The Station does not have a Spill Prevention, Controls, and Countermeasures Plan or a Spill Prevention and Response Plan.

V. CONCLUSIONS

Information obtained through interviews with seven past and present Station personnel, reviews of Station records, and field observations identified no contaminated disposal and/or spill sites on Station property.

VI. RECOMMENDATIONS

No further IRP investigation is recommended for the Station.

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GLOSSARY OF TERMS

ALLUVIAL - Pertaining to or composed of alluvium, or deposited by a stream of running water.

ALLUVIUM - A general term for detrital deposits made by streams on river beds, flood plains, and alluvial fans. The term applies to stream deposits of recent time.

ANNUAL PRECIPITATION - The total amount of rainfall and snowfall for the year.

ANTICLINE - A fold, generally convex upward, whose core contains the stratigraphically older rocks.

AQUICLUDES - A body of rock that will absorb water slowly but will not transmit it fast enough to supply a well or spring.

AQUIFER - A body of rock that is sufficiently permeable to conduct groundwater and yield economically significant quantities of water to wells and springs.

ARGILLACEOUS - Like or containing clay.

ARTESIAN AQUIFER - A water-bearing bed that contains water under hydrostatic pressure.

BASALT - A dark colored igneous rock, commonly extrusive, composed primarily of calcic plagioclase and pyroxene; the fine grained equivalent of gabbro.

BASIN - (a) A depressed area with no surface outlet; (b) A drainage basin or river basin; (c) A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated.

BAY - A wide, curving open indentation, recess, or inlet of a sea or lake into the land or between two capes or headlands, larger than a cove, and usually smaller than, but of the same general character as a gulf.

BED [stratig] - The smallest formal unit in the hierarchy of lithostratigraphic units. In a stratified sequence of rocks, it is distinguishable from layers above and below. A bed commonly ranges in thickness from a centimeter to a few meters.

BEDDING [stratig] - The arrangement of sedimentary rock in beds or layers of varying thickness and character.

BEDROCK - A general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.

BOULDER - A detached rock mass larger than a cobble, having a diameter greater than 256 mm, being somewhat rounded or otherwise distinctly shaped by abrasion in the course of transport.

CALCAREOUS - Containing calcium carbonate.

CLAY [geol] - A rock or mineral fragment or a detrital particle of any composition smaller than a fine silt grain, having a diameter less than 1/256 mm (4 microns).

CLAY [soil] - A rock or mineral particle in the soil having a diameter less than 0.002 mm (2 microns).

COARSE-GRAINED - 1. Said of a crystalline rock, and of its texture, in which the individual minerals are relatively large, e.g. an igneous rock whose particles have an average diameter greater than 5 mm (0.2 inc.) 2. Said of a sedimentary rock, and of its texture, in which the individual constituents are easily seen with the unaided eye, i.e. have an average diameter greater than 2 mm (0.08 in.)

COARSE-TEXTURED - (light textured) SOIL - Sand or loamy sand.

COBBLE - A rock fragment between 64 and 256 mm in diameter, thus larger than a pebble and smaller than a boulder, rounded or otherwise abraded in the course of aqueous, eolian, or glacial transport.

CONE OF DEPRESSION - The depression of heads around a pumping well caused by the withdrawal of water.

CONFINED AQUIFER - An aquifer bounded above and below by impermeable beds, or by beds of distinctly lower permeability than that of the aquifer itself.

CONFORMABLE - Said of strata characterized by an unbroken sequence in which the layers are formed one above the other in parallel order by uninterrupted deposition; also, said of the contacts between such strata.

CONGLOMERATE - A coarse-grained sedimentary rock, composed of rounded pebbles, cobbles, and boulders, set in a fine-grained matrix of sand or silt, and commonly cemented by calcium carbonate, iron oxide, silica, or hardened clay.

CONSOLIDATION - Any process whereby loosely aggregated, soft, or liquid earth materials become firm and coherent rock; specif. the solidification of a magma to form an igneous rock, or the lithification of loose sediments to form a sedimentary rock.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act of 1986 (SARA) shall include, but not be limited to any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress),

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substances Control Act;

and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CREEK - A term generally applied to any natural stream of water, normally larger than a brook but smaller than a river.

CRITICAL HABITAT - The specific areas within the geographical area occupied by the species on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection.

CUESTA - An asymmetrical ridge, with a long, gentle slope on one side conforming with the dip of the underlying strata, and a steep or clifflike face on the other side formed by the outcrop of the resistant beds.

DEPOSITS - Earth material of any type, either consolidated or unconsolidated, that has accumulated by some natural process or agent.

DIP - The angle that a stratum or any planar feature makes with the horizontal, measured perpendicular to strike and in the vertical plane.

DOLOMITE - A sedimentary rock consisting of calcium magnesium carbonate, $CaMg(Co_3)_2$. Occurs in beds formed by the alteration of limestone.

DRAINAGE CLASS (natural) - Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained - Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained - Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well-drained - Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well-drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained - Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly

have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained - Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained - Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough periods during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained - Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

DRAINAGEWAY - A channel or course along which water moves in draining an area.

DRUMLIN - A low, smoothly rounded, elongate hill of compact glacial till, or rarely other kinds of drift, built under the margin of the ice and shaped by its flow, or carved out of an older moraine by readvancing ice; its longer axis is parallel to the direction of movement of the ice.

END MORAINE - A ridgelike accumulation of till that marks a stillstand position of a present or past glacier front.

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range, other than a species of the Class Insecta determined by the secretary to constitute a pest whose protection would present an overwhelming and overriding risk to man.

EROSION - The general process or the group of processes whereby the materials of the Earth's crust are loosened, dissolved, or worn away, and simultaneously moved from one place to another by natural agencies, but usually exclude mass wasting.

ESCARPMENT - A long, more or less continuous cliff or relatively steep slope facing in one general direction, separating two level or gently sloping surfaces, and produced by erosion or faulting.

FAULT - A fracture or fracture zone along which there has been displacement of the sides relative to one another parallel to the fracture.

FELDSPAR - Any of several crystalline minerals made up of aluminum silicates with sodium, potassium, or calcium, usually glassy and moderately hard, found in igneous rocks.

FERRUGINOUS - Pertaining to or containing iron.

FINE-GRAINED - 1. Said of an igneous rock, and its texture, whose particles have an average diameter less than 1 mm (0.04 in.). 2. Said of a sedimentary rock, and of its texture, in which the particles have an average diameter less than 1/16 mm (62 microns, or silt size and smaller).

FINE-TEXTURED (heavy textured) SOIL - Sandy clay, silty clay, and clay.

FLOOD PLAIN - The surface or strip of relatively smooth land adjacent to a river channel, constructed by the present river in its existing regimen and covered with water when the river overflows its banks.

FOLD [geol struc] - A curve or bend of a planar structure such as rock strata, bedding planes, foliation or cleavage.

FORMATION - A lithologically distinctive, mappable body of rock.

FOSSILIFEROUS - Containing fossils.

FRACTURE [struc geol] - A general term for any break in a rock, whether or not it causes displacement, due to mechanical failure by stress. Fracture includes cracks, joints, and faults.

GEOLOGIC TIME - See Figure Gl.1.

GLACIAL - (a) Of or relating to the presence and activities of ice or glaciers, (b) Pertaining to distinctive features and materials produced or derived from glaciers and ice sheets.

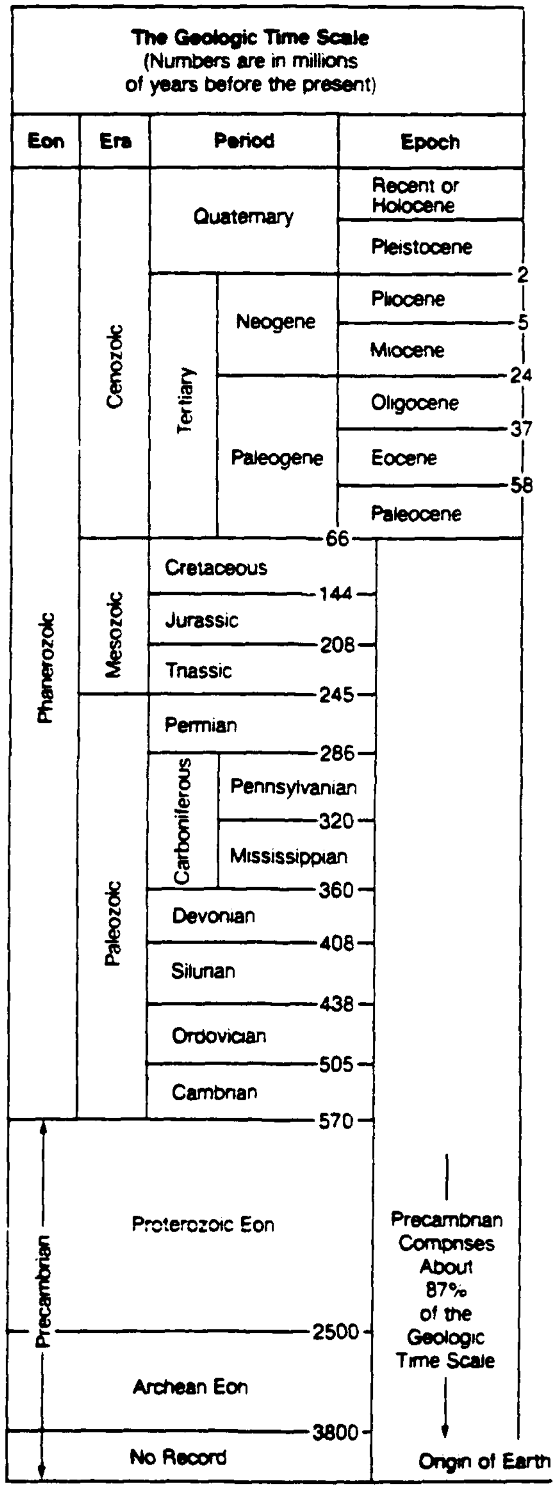


Figure Gl.1

The Geologic Time Scale

GLACIAL DRIFT - A general term for drift transported by glaciers or icebergs and deposited on land or in the sea.

GLACIAL TILL - Unstratified drift, deposited directly by a glacier without reworking by meltwater and consisting of a mixture of clay, silt, sand, gravel, and boulders ranging widely in size and shape.

GLAUCONITIC SANDSTONE - Greensand, composed of a green mineral, closely related to the micas and essentially a hydrous potassium iron silicate.

GRANITE - Broadly applied, any crystalline, quartz-bearing plutonic rock; also commonly contains feldspar, mica, hornblende, or pyroxene.

GRANODIORITE - A group of coarse-grained plutonic rocks intermediate in composition between quartz diorite and quartz monzonite, containing quartz, plagioclase, and potassium feldspar with biotite, hornblende, or more rarely, pyroxene, as the mafic contents.

GRAVEL - An unconsolidated, natural accumulation of rounded rock fragments resulting from erosion, consisting predominantly of particles larger than sand, such as boulders, cobbles, pebbles, granules or any combination of these fragments.

GROUNDWATER - Refers to the subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, December 11, 1981.)

HAS - Hazard Assessment Score - The score developed by using the Hazard Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

a. cause, or significantly contribute to, an increase in mortality or an increase in serious or incapacitating reversible illness, or

b. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HERBICIDE - A weed killer.

HILL - A natural elevation of the land surface, rising rather prominently above the surrounding land, usually of limited extent and having a well-defined outline (rounded) and generally considered to be less than 1000 feet from base to summit.

IGNEOUS ROCKS - Rock or mineral that has solidified from molten or partially molten material, i.e. from magma.

INTERBEDDED - Beds lying between or alternating with others of different character; especially rock material laid down in sequence between other beds.

KAME - A mound, knob, or short irregular ridge, composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a superglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

LACUSTRINE - Pertaining to, produced by, or inhabiting a lake or lakes.

LENTICULAR - 1. Resembling in shape the cross section of a lens. 2. Pertaining to a stratigraphic lens or lentil.

LIMESTONE - A sedimentary rock consisting of the mineral calcite (calcium carbonate, $CaCO_3$) with or without magnesium carbonate.

LIMONITE - A common secondary material, formed by weathering (oxidation) of iron-bearing materials.

LITHOLOGY - (a) The description of rocks. (b) The physical character of a rock.

LOAM - A rich, permeable soil composed of a friable mixture of relatively equal proportions of sand, silt, and clay particles, and usually containing organic matter.

MEAN LAKE EVAPORATION - The total evaporation amount for a particular area; amount based on precipitation and climate (humidity).

MEDIUM-GRAINED - 1. Said of an igneous rock, and of its texture, in which the individual crystals have an average diameter in the range of 1-5 mm (0.04 - 0.2 in.). 2. Said of a sedimentary rock, and of its texture, in which the individual particles have an average diameter in the range of 1/16 to 2 mm (62-2000 microns, or sand size).

METAMORPHIC FACIES - A set of metamorphic rocks characterized by particular mineral associations, indicating origin under restricted temperature - pressure conditions.

METAMORPHIC ROCK - Any rock derived from pre-existing rocks by mineralogical, chemical, and/or structural changes, essentially in solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environment, generally at depth in the Earth's crust.

MIGRATION [Contaminant] - The movement of contaminants through pathways (groundwater, surface water, soil, and air).

MINERAL - A naturally occurring inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal form and physical properties.

MORAINE - A mound or ridge of unstratified glacial drift, chiefly till, deposited by direct action of glacier ice.

MORPHOLOGY - The shape of the earth's surface.

NET PRECIPITATION - Precipitation minus evaporation.

NORMAL FAULT - A fault in which the hanging wall appears to have moved downward relative to the footwall. The angle of dip is usually 45° - 90°.

OUTCROP - That part of a geologic formation or structure that appears at the surface of the Earth.

OUTWASH [glac geol] - A stratified detritus (chiefly sand and gravel) removed or "washed out" from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of an active glacier.

OUTWASH PLAIN - a broad, gently sloping sheet of outwash deposited by meltwater streams flowing in front of or beyond a glacier, and formed by coalescing outwash fans.

PELITE - 1. A mudstone or lutite. 2. The metamorphic derivation of lutite.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment by the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

PLAGIOCLASE - 1. A group of triclinic feldspars of general formula (Na, Ca) Al(Si, Al) Si_2O_8. Among the commonest rock-forming minerals. 2. A mineral of the plagioclase group.

PLUNGE - The inclination of a fold axis or other linear feature, measured in the vertical plane.

POND - A natural body of standing fresh water occupying a small surface depression, usually smaller than a lake and larger then a pool.

POROSITY - The ratio of the aggregate volume of interstices in a rock or soil to its total volume.

POTENTIOMETRIC SURFACE - An imaginary surface representing the total head of groundwater and defined by the level to which water will rise in a well. The water table is a particular potentiometric surface.

QUARTZ - A crystalline silica, an important rock forming mineral: SiO_2. Occurs either in transparent hexagonal crystals (colorless or colored by impurities) or in crystalline or cryptocrystalline masses. Forms the major proportion of most sands and has a widespread distribution in igneous, metamorphic and sedimentary rocks.

RECHARGE - The processes involved in the addition of water to the zone of saturation; also, the amount of water added.

RIVER - A general term for a natural freshwater surface stream of considerable volume and a permanent or seasonal flow, moving in a definite channel toward a sea, lake, or another river.

SAND - A rock or mineral particle in the soil, having a diameter in the range 0.52 - 2 mm.

SANDSTONE - A medium-grained fragmented sedimentary rock composed of abundant round or angular sand fragments set in a fine-grained matrix (silt or clay) and more or less firmly united by a cementing material (commonly silica, iron oxide, or calcium carbonate).

SANDY LOAM - A soil containing 43 - 85% sand, 0 - 50% silt, and 0 - 20% clay, or containing at least 52% sand and no more than 20% clay and having the percentage of silt plus twice the percentage of clay exceeding 30% or containing 43 - 52% sand, less than 50% silt, and less than 7% clay.

SCHIST - A medium- or coarse-grained, strongly foliated, crystalline rock; formed by dynamic metamorphism.

SEDIMENTARY ROCK - A rock resulting from the consolidation of loose sediment that has accumulated in layers; e.g., a clastic rock (such as conglomerate or tillite) consisting of mechanically formed fragments of older rock transported from its source and deposited in water or from air or ice; or a chemical rock (such as rock salt or gypsum) formed by precipitation from solution; or an organic rock (such as certain limestones) consisting of the remains or secretions of plants and animals.

SHALE - A fine-grained detrital sedimentary rock, formed by the consolidation (especially by compression) of clay, silt, or mud.

SILT [soil] - (a) A rock or mineral particle in the soil, having a diameter in the range 0.002-0.005 mm; (b) A soil containing more than 80% silt-size particles, less than 12% clay, and less than 20% sand.

SILT LOAM - A soil containing 50 - 88% silt, 0 - 27% clay and 0 - 50% sand.

SILTSTONE - An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

SLATE - A compact, fine-grained metamorphic rock that possesses slaty cleavage and hence can be split into slabs and thin plates. Most slate was formed from shale.

SLUICEWAY - 1. An artificial channel into which water is let by a sluice. 2. A channel through which a large volume of water passed.

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as the distance per unit time that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow	-	less than 0.06 inches per hour (less than 4.24×10^{-5} cm/sec)
Slow	-	0.06 to 0.20 inches per hour (4.24×10^{-5} to 1.41×10^{-4} cm/sec)
Moderately Slow	-	0.20 to 0.63 inches per hour (1.41×10^{-4} to 4.45×10^{-4} cm/sec)

Moderate - 0.63 to 2.00 inches per hour (4.45×10^{-4} to 1.41×10^{-3} cm/sec)

Moderately Rapid - 2.00 to 6.00 inches per hour (1.41×10^{-3} to 4.24×10^{-3} cm/sec)

Rapid - 6.00 to 20.00 inches per hour (4.24×10^{-3} to 1.41×10^{-2} cm/sec)

Very Rapid - more than 20.00 inches per hour (more than 1.41×10^{-2} cm/sec)

(Reference: U.S.D.A. Soil Conservation Service)

SOLVENT - A substance, generally a liquid, capable of dissolving other substances.

SORTED - Said of a sediment or detrital rock consisting of uniform size lying within the limits of a single grade.

STRATIFIED - Formed, arranged, or laid down in layers or strata; especially said of any layered sedimentary rock or deposit.

STRATIGRAPHIC UNIT - A body of strata recognized as a unit for description, mapping, or correlation.

STRIKE - The direction taken by a structural surface, e.g., a bedding or fault plane, as it intersects the horizontal.

STRUCTURAL - Of or pertaining to rock deformation or to features that result from it.

SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.

SWAMP - An area intermittently or permanently covered with water, having shrubs and trees but essentially without the accumulation of peat.

TECTONIC - Pertaining to the forces involved in, or the resulting structures of, tectonics.

TECTONICS - A branch of geology dealing with the broad architecture of the outer part of the earth, that is, the major structural or deformational features and their relations, origin, and historical evolution.

TERMINAL MORAINE - The outermost end moraine of a glacier or ice sheet, marking the maximum advance of the ice.

TERRACE [geomorph] - Any long, narrow, relatively level or gently inclined surface, generally less broad than a plain, bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope.

THREATENED SPECIES - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

THRUST FAULT - A fault with a dip of 45° or less over much of its extent, on which the hanging wall appears to have moved upward relative to the footwall. Horizontal compression rather than vertical displacement is its characteristic feature.

TILL - Dominantly unsorted and unstratified drift, generally unconsolidated, deposited directly by and underneath a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand and gravel and boulders ranging widely in size and shape.

TIME [Geologic] - See Figure Gl.1.

TOPOGRAPHY - The general conformation of a land surface, including its relief and the position of its natural and man-made features.

UNCONFORMITY - A break or gap in the geologic record, such as an interruption in the normal sequence of deposition of sedimentary rocks, or a break between eroded metamorphic rocks and younger sedimentary strata. 2. The structural relationship between two groups of rocks that are not in normal succession; also, their surface of contact.

UNCONSOLIDATED - (a) Sediment that is loosely arranged or unstratified, or whose particles are not cemented together, occurring either at the surface or at depth. (b) Soil material that is in a loosely aggregated form.

VALLEY - Any low-lying land bordered by higher ground, especially an elongate, relatively large, gently sloping depression of the earth's surface, commonly situated between two mountains or between ranges of hills and mountains, and often containing a stream or river with an outlet. It is usually developed by stream or river erosion, but can be formed by faulting.

VOLCANIC - Pertaining to the activities, structures, or rock types of a volcano.

WATER TABLE - The upper limit of the portion of the ground that is wholly saturated with water; the surface on which the fluid pressure in the pores of a porous medium is exactly atmospheric.

WETLANDS - Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

WILDERNESS AREA - An area unaffected by anthropogenic activities and deemed worthy of special attention to maintain its natural condition.

Appendix A

Outside Agency Contact List

OUTSIDE AGENCY CONTACT LIST

1) Central Maine Power Company
Box 1801
162 Canco Road
Portland, Maine 04103
Walter Johnson
(207) 828-1411

2) City of South Portland, Maine
Assessor
25 Cottage Road
South Portland, Maine 04106
Elizabeth Cumback, C.M.A.
(207) 767-3201

3) City of South Portland, Maine
Code Enforcement Officer
25 Cottage Road
South Portland, Maine 04106
Patricia A. Doucette
(207) 767-3201 Ext. 13

4) City of South Portland, Maine
Engineering Department
25 Cottage Road
South Portland, Maine 04106
Edward A. Reidman, P.E. and Dave Kasik
(207) 767-3201

5) Maine Geological Survey
State House Station 22
Augusta, Maine 04333
Tom Weddle and Marc Loiselle
(207) 289-2801

6) Portland Water District
225 Douglass Street
Box 3553
Portland, Maine 04104-3553
Glenn F. Hunter, P.E.
(207) 774-5961

OUTSIDE AGENCY CONTACT LIST (continued)

7) State of Maine
Department of Environmental Protection
Water Bureau
312 Canco Road
Portland, Maine 04103
Susanne Willard
(207) 879-6300

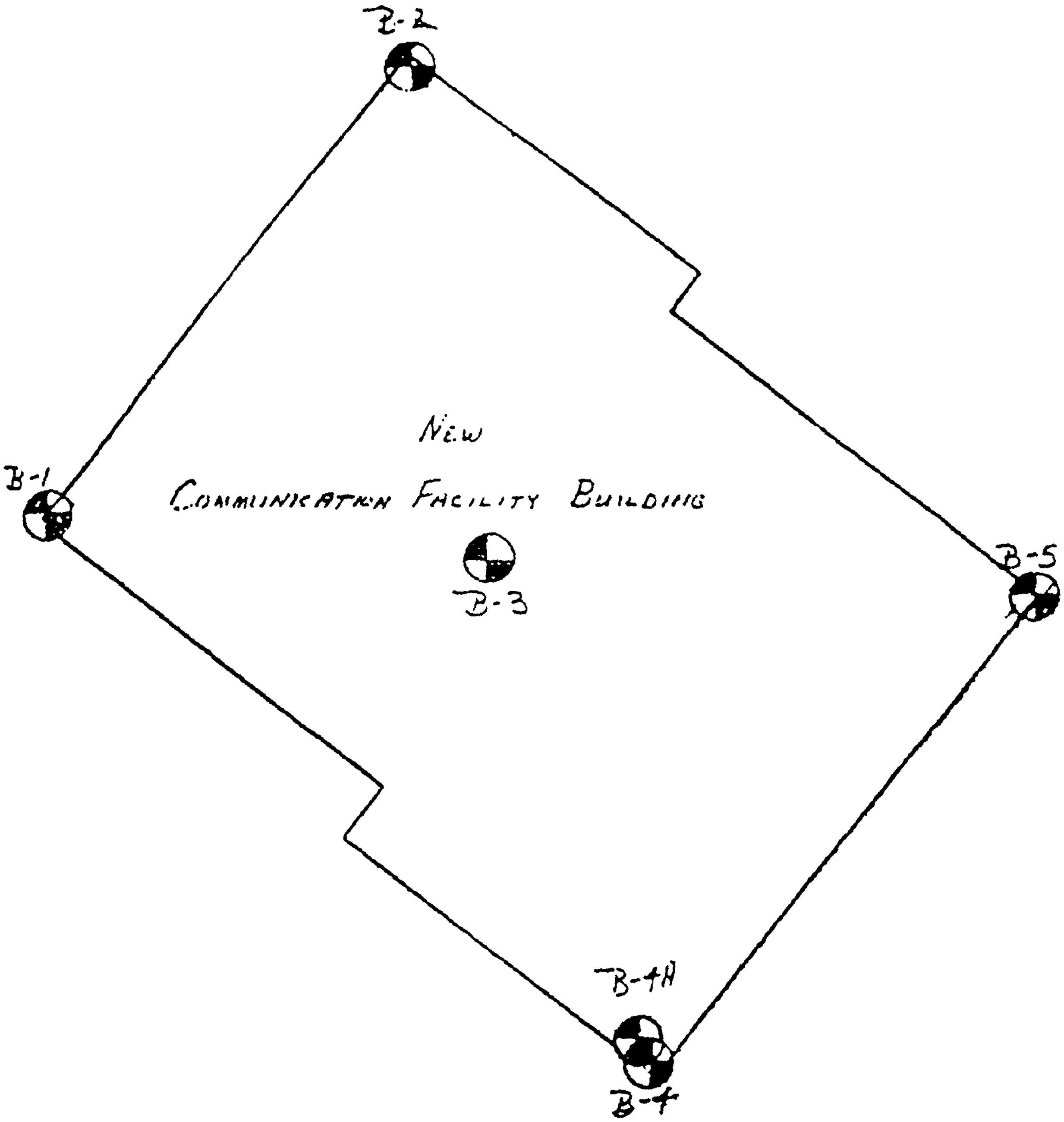
8) State of Maine
Critical Areas Program
State Planning Office
Station 38
Augusta, Maine 04333
Henry Tyler
(207) 289-5756

9) State of Maine
Maine Fish and Wildlife
284 State Street
Augusta, Maine 04333
Steve Timpano
(207) 289-3286

10) United States Department of Agriculture
Soil Conservation Service
1A Karen Drive
Westbrook, Maine 04092
(207) 871-9247

Appendix B

Soil Borings at the Station


B-2
New
Communication Facility Building
B-1
B-3
B-5
B-4A
B-4

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT: Stevens Associates

SHEET 1 OF 1
HOLE NO. B-1

DRILLER: A. Jon Rudnicki
PROJECT NAME: Air Guard
LINE & STATION:

T.B. JOB NUMBER: 85-165
LOCATION: S. Portland, ME
OFFSET:

GROUND WATER OBSERVATIONS
AT ____ FT. AFTER ____ HOURS
AT ____ FT. AFTER ____ HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	BW	SS	
SIZE I.D.	2 3/8"	1 3/8"	
HAMMER WT.	300	140	
HAMMER FALL	16"	30"	

DATE START 8-14-85 DATE FIN 8-14-85
SURFACE ELEV. 163± (Project Datum)
GROUND WATER ELEV.

CASING BLOWS PER FOOT	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	VANE READING	DEPTH	STRATUM DESCRIPTION
auger										1.0	Brown sity gravelly sand (clean) (Fill)
"											
"	1D	2"	18"	-	3.5	4	7	11		2.5	Black siltv gravellv sand w/organics.
"											SILTY SAND WITH SOME GRAVEL Brown ~~silty gravelly sand.~~
"										5.0	~ MEDIUM DENSE ~
7	2D	2"	18"		6.5	4	5	6		6.2	BROWN w = 31.1% γp = 6.0-6.4 ksf Gray mottled sity sandy clay. ~ VERY STIFF ~
11											γp = 3.5-4.0 ksf
13											
15											~ STIFF ~
15											
22											Gray silty sandy clay.
19	1C	2"	24"		12.0	Hydraulic	push				w = 31.2% γp: 2.0-2.4 ksf
19	2 x	7 vane			12'7"				32/15	Sv: 1.17/0.56 ksf	
14	2 x	7 vane			13'2"				32/14	Sv: 1.19/0.52 ksf	
9											
12	C	2"	18"	0.0	16.5	Wt. of 2 men				16.5	w = 17.9%
11	3D	2"	24"		17.0	Wt. of		rod	4		
12											CLAYEY SANDY SILT WITH SOME GRAVEL Gray ~~silty gravelly sand.~~
19											(TILL-LIKE)
23											~ MEDIUM DENSE ~
39	4D	2"	18"		21.5	7	7	7			w = 11.3%
34											
75										23.0	
											Refusal @ 23.0'

SAMPLES
D = Split Spoon
C = 2" Shelby Tube
U = 3½" Shelby Tube

SOIL CLASSIFIED BY:
☒ Driller - Visually
☒ Soil Technician - Visually
☒ Laboratory Tests

REMARKS:
Stratification lines represent the approximate boundary between soil types, and the transition may be gradual.

HOLE NO. B-1 (2)

B-14

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT: Stevens Associates

SHEET 1 OF 1
HOLE NO. B-2

DRILLER: A. Jon Rudnicki
PROJECT NAME: Air Guard
LINE & STATION:

M.T.B. JOB NUMBER: 85-165
LOCATION: S. Portland, ME
OFFSET:

GROUND WATER OBSERVATIONS

AT ____ FT. AFTER ____ HOURS

AT ____ FT. AFTER ____ HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	4"	SS	
SIZE I.D.	4"	1 3/8"	
HAMMER WT.	300	140	
HAMMER FALL	16"	30"	

DATE START 8-14-85 DATE FIN. 8-14-85

SURFACE ELEV. 163± (Project Datum)

GROUND WATER ELEV. ____

CASING BLOWS PER FOOT	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	VANE READING	DEPTH	STRATUM DESCRIPTION
augers										1.0	Brown silty gravelly sand. (FILL)
"											— MEDIUM DENSE —
"	1D	2"	18"		3.5	5	7	12		3.0	Black silty fine sand w/~~trace of~~ some organics.
"											
"										4.5	Brown silty med. sand.
9	2D	2"	18"		6.5	4	3	3		5.5	Brown mottled silty sandy clay. w=30.7% — VERY STIFF —
12											qu=1.47 ksf w=25.1% qp 3.2-3.0 ksf — STIFF —
11	1U	3½"	16"		8.3	Hydraulic	push				Gray silty sandy clay to gray silty fine sand w/ clay layers. w=21.2% qp 2.6-3.0 ksf
15										9.0	
32											
7	3D	2"	18"		11.5	11	7	8			w=11.0%
8											
8											
10											Gray silty gravelly sand. (TILL-LIKE)
24											— MEDIUM DENSE —
18	4D	2"	18"		16.5	9	9	10			
24											
27											
36											
68										21.3	
	5D	2"	18"		21.5	7	7	50			
										21.5	Decomposed rock.

Refusal @ 21.5'
WAter @ 8.7' w/20.0' casing

SAMPLES
D = Split Spoon
C = 2" Shelby Tube
U = 3½" Shelby Tube

SOIL CLASSIFIED BY:
[X] Driller - Visually
[X] Soil Technican - Visually
[X] Laboratory Tests

REMARKS
Stratification lines represent the approximate boundary between soil types, and the transition may be gradual.

HOLE NO B-2 (3)

MTB-14

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT: Stevens Associates

SHEET 1 OF 1
HOLE NO. B-3

DRILLER: A. Jon Rudnicki
PROJECT NAME: Air Guard
LINE & STATION:

M.T.B. JOB NUMBER: 85-165
LOCATION: S. Portland, ME
OFFSET:

GROUND WATER OBSERVATIONS
AT ______ FT. AFTER ______ HOURS
AT ______ FT. AFTER ______ HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	BW	SS	
SIZE I.D.	2 3/8"	1 3/8"	
HAMMER WT.	300	140	
HAMMER FALL	16"	30"	

DATE START 8-14-85 DATE FIN. 8-14-85
SURFACE ELEV. 163± (PROJECT DATUM)
GROUND WATER ELEV. ______

CASING BLOWS PER FOOT	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	VANE READING	DEPTH	STRATUM DESCRIPTION
auger										1.0	Brown silty gravelly sand. (FILL)
"											
"	1D	2"	18"		3.5	7	8	8		3.0	Brown med. sand w/rust layers. W = 10.1% ~ MEDIUM DENSE ~
"											
"										4.5	Brown med. sand w/trace of silt. ~ MEDIUM DENSE ~
4	2D	2"	18"		6.5	4	5	15		5.5	Brown mottled sandy clay.
25											W = 24.3% Qp = 5.0 - 7.0 KSF Gray silty ~~sandy~~ clay, WITH SOME SAND ~ VERY STIFF ~
11											
10										9.0	
12											
18	3D	2"	18"		11.5	4	4	5			Gray/BROWN silty med. fine sand w/trace of gravel & CLAY (TILL LIKE) W = 12.5% ~ LOOSE TO MEDIUM DENSE ~
12											
24											
16										— ? —	GRAY SANDY SILT WITH TRACE OF CLAY AND GRAVEL (TILL)
13											
11	4D	2"	18"		16.5	11	13	12			W = 11.0%
19											~ MEDIUM DENSE. ~
30										18.2	
											Refusal @ 18.2'

SAMPLES
D = Split Spoon
C = 2" Shelby Tube
U = 3½" Shelby Tube

SOIL CLASSIFIED BY:
[X] Driller - Visually
[X] Soil Technician - Visually
[X] Laboratory Tests

REMARKS:
Stratification lines represent the approximate boundary between soil types, and the transition may be gradual.

HOLE NO. B-3 (4)

B-14

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT: Stevens Associates

SHEET 1 OF 1
HOLE NO. B-4

DRILLER: A. Jon Rudnicki
PROJECT NAME: Air Guard
LINE & STATION:

M.T.B. JOB NUMBER: 85-165
LOCATION: S. Portland, ME
OFFSET:

GROUND WATER OBSERVATIONS
AT ______ FT. AFTER ______ HOURS
AT ______ FT. AFTER ______ HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	BW	SS	
SIZE I.D.	2 3/8"	1 3/8"	
HAMMER WT.	300	140	
HAMMER FALL	16"	30"	

DATE START 8-14-85 DATE FIN. 8-14-85
SURFACE ELEV. 164± [illegible]
GROUND WATER ELEV. ______

CASING BLOWS PER FOOT	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	VANE READING	DEPTH	STRATUM DESCRIPTION
auger										1.0	Brown silty sandy topsoil.
"											— DENSE —
"	1D	2"	18"		3.5	11	16	18		3.0	Brown silty med. fine sand. WITH TRACE OF GRAVEL
"											— DENSE —
"										4.5	Brown med. sand w/rust layers.
4	2D	2"	18"		6.5	3	3	3		5.5	Brown mottled ~~sandy~~ clay. [illegible]
6											W: 49.9% qp: 2.6-4.0 ksf
5											— STIFF BECOMING . . .
4											Gray silty sandy clay.
4											. . . MEDIUM TO SOFT WITH DEPTH —
6											
4	1C	2"	24"		12.0	Wt. of man					
4	2 x	7 vane			12'7"				12/6	Sv: 0.44/0.22 ksf	qu: 0.50 ksf qp: 1.0 ksf
4	2 x	7 vane			13'2"				14/6	Sv: 0.35/0.22 ksf 14.0	W: 41.9%
5											(OR SANDY SILT)
9	3D	2"	18"		16.5	0	1	1			Brown silty fine sand w/clayey silt layers.
9											— LOOSE —
10											
10										19.0	
12											
13	4D	2"	18"		21.5	9	5	5			Gray silty ~~clayey~~ fine sand w/ trace of clay [illegible] (TILL-LIKE)
13											
15										23.4	— MEDIUM DENSE —
50											

Refusal @ 23.4'

SAMPLES
D = Split Spoon
C = 2" Shelby Tube
U = 3½" Shelby Tube

SOIL CLASSIFIED BY:
☒ Driller - Visually
☒ Soil Technician - Visually
☒ Laboratory Tests

REMARKS:
Stratification lines represent the approximate boundary between soil types, and the transition may be gradual.

HOLE NO. B-4 (5)

MTB-14

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT: Stevens Associates

SHEET 1 OF 1
HOLE NO. B-4A

DRILLER: A. Jon Rudnicki
PROJECT NAME: Air Guard
LINE & STATION:

T.B. JOB NUMBER: 85-165
LOCATION: S. Portland, ME
OFFSET:

GROUND WATER OBSERVATIONS
AT ______ FT. AFTER ______ HOURS
AT ______ FT. AFTER ______ HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	4"	SS	
SIZE I.D.	4"	1 3/8"	
HAMMER WT.	300	140	
HAMMER FALL	16"	30"	

DATE START 8-15-85 DATE FIN 8-15-85
SURFACE ELEV. 164± (Project Datum)
GROUND WATER ELEV. ______

CASING BLOWS PER FOOT	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	VANE READING	DEPTH	STRATUM DESCRIPTION
auger										1.0	Brown silty sandy topsoil
"											
"										3.0	Brown silty med. fine sand.
"											
"										4.5	Brown med. sand w/rust layers.
										5.5	Brown mottled sandy clay.
											— STIFF BECOMING ...
	1U	3½"	24"		8.8	Hydraulic push					Gray silty sandy clay w/fine sand layers.
	3½ x 7 vane				9'5"				42/10		S_v: 0.49/0.12 ksf q_u: 1.56 ksf W: 35.6% W_L: 28.6 q_p: 1.0-2.0 ksf
	3½ x 7 vnae				10'0"				39/10		S_v: 0.46/0.12 ksf W_p: 18.0
											... MEDIUM TO SOFT WITH DEPTH —
	2U	3½"	24"		12.1	Wt. of man					S_v: 0.34/0.06 ksf q_u: 0.62 ksf W: 41.0% W_L: 36.0 q_p: 0.7-0.8 ksf
	3½ x 7 vane				12'8"				31/5	13.3	S_v: 0.90/0.13 ksf W_p: 21.7
	3½ x 7 vane				13'3"				68/11		

Bottom of boring @ 13.3'

SAMPLES
D = Split Spoon
C = 2" Shelby Tube
U = 3½" Shelby Tube

SOIL CLASSIFIED BY:
[X] Driller - Visually
[X] Soil Technician - Visually
[X] Laboratory Tests

REMARKS:
Stratification lines represent the approximate boundary between soil types, and the transition may be gradual.

HOLE NO. B-4A (6)

TB-14

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT: Stevens Associates

SHEET 1 OF 1
HOLE NO. B-5

DRILLER: A. Jon Rudnicki

PROJECT NAME: Air Guard

LINE & STATION:

M.T.B. JOB NUMBER: 85-165

LOCATION: S. Portland, ME

OFFSET:

GROUND WATER OBSERVATIONS
AT ______ FT. AFTER ______ HOURS
AT ______ FT. AFTER ______ HOURS

	CASING	SAMPLER	CORE BARREL
TYPE	BW	SS	
SIZE I.D.	2 3/8"	1 3/8"	
HAMMER WT.	300	140	
HAMMER FALL	16"	30"	

DATE START 8-14-85 DATE FIN 8-14-85
SURFACE ELEV 16± (PROJECT DATUM)
GROUND WATER ELEV. ______

CASING BLOWS PER FOOT	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	VANE READING	DEPTH	STRATUM DESCRIPTION
										1.0	Sandy silty topsoil.
	1D	2"	18"		3.5	12	12	14		4.5	(FINE TO) Brown med. sand some silt. — MEDIUM DENSE TO DENSE —
4	2D	2"	18"		6.5	5	5	5		6.0	Brown mottled silty sandy clay. W=13.5% [illegible] — VERY STIFF —
5											— VERY STIFF —
8											
9											
10											Gray silty sandy clay.
10											— MEDIUM TO SOFT BECOMING ...
10	1C	2"	24"		12.0						
10	2 x 7 vane				12'7"				41/11	S_v=1.52/0.41 ksf	q_u= 0.60-0.77 ksf W= 37.3% q_p: 0.8-2.0 ksf
14	2 x 7 vane				13'2"				50+	S_v=1.86+ ksf 14.6	... VERY STIFF WITH DEPTH —
50											
											Refusal @ 14.6'

SAMPLES
D = Splitt Spoon
C = 2" Shelby Tube
U = 3½" Shelby Tube

SOIL CLASSIFIED BY:
☒ Driller - Visually
☒ Soil Technican - Visually
☒ Laboratory Tests

REMARKS: Stratification lines represent the approximate boundary between soil types, and the transition may be gradual.

HOLE NO. B-5 (7)

TB-14